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# Soil Carbon Dynamics in the Contaminated Mersey Estuarine Plain, UK: Implication for Carbon Sequestration

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## Extended Abstract

Soil carbon sequestration is an option for mitigating global warming (Lal, 2004). Soil organic carbon (SOC) storage in a given soil is determined by the balance between the input of organic matter into soil and the loss of soil organic matter through decomposition and erosion (He et al., 2013)

Apart from providing a wide array of benefits to coastal populations, including shoreline protection, immobilisation of pollutants (Burden et al 2013), fishery support, water quality improvement, wildlife habitat provision, saltmarsh ecosystems also act as an important carbon sink or source (Chen et al., 2015). There are approximately 47,000 ha of saltmarsh land in the UK (Burd 1989). They are classified primarily by the frequency of tidal inundation.

The Mersey estuary is arguably one of the most contaminated estuarine systems in the Europe (Collings et al., 1996; Fox et al., 2001). The origin/sources of contamination level of the Mersey estuary have been a topic of considerable debate over the past 40 years (Ridgway, 2002). In-depth research into soil carbon dynamics in contaminated coastal wetland soils is rare.

A study on the interaction of heavy metal with soil organic matter was conducted in Mersey estuarine plain, North West England where over 200 years of contamination has been reported. 52 represented soil samples were collected from various depths. A range of soil parameters, including pH, Eh, EC, bulk density, soil organic content and functional groups, and various heavy metals and metalloids was determined. Characterisation of organic carbon was analysed using FT-IR and NMR. Heavy metals and metalloids were determined by ICP-OES after microwave $HNO_3$-HF-$H_2O_2$ digestion. Statistical analysis was performed by IBM SPSS 20 version.

The results indicated that soil pH was neutral to slightly alkaline. Redox potential (Eh) values were negative except for the upper part of the soils as a result of water table fluctuation. Electrical conductivity was relatively high, indicating certain level of soil salinity. Bulk density was higher in the grazed area than in the un-grazed area. However, there was no relationship between bulk density and soil organic carbon content. Heavy metals (Zn, Cu, Cr, As, Cd, and Ni) were significantly positively correlated with soil organic carbon content ($R^2$= 0.7228, $R^2$= 0.662, $R^2$= 0.5649, $R^2$= 0.9683, $R^2$= 0.9786 and $R^2$= 0.8441 respectively). The presence of heavy metals and metalloids in the soils may affect the rates of organic matter decomposition. This fundamental knowledge can be used to evaluate soil carbon status and predict future trend in soil carbon storage

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