The effects of climate change have already been seen globally, with predictions of higher rainfall and an increase in storms modelled for Ireland in the future. Coastal wetlands are known sinks for carbon and can continue to act to mitigate climate change even as sea levels rise. They provide a myriad of wildlife habitats and help to protect coastal communities and economies by functioning as natural sponges that can lower flood heights, dissipate storm surges, protect against erosion, capture of metals and pollutants, and cycling of nutrients.

In recent years, scientists and policymakers have pushed to highlight and protect carbon stored in coastal wetlands, known as blue carbon. Blue carbon is the term for carbon sequestered by the world's ocean and coastal ecosystems. Tidal wetlands and vegetated coastal marshes have a very high capacity for the uptake and long-term storage of carbon. The high capacity for carbon storage is a result of at least three characteristics of coastal wetlands: (1.) They can efficiently capture and assimilate particulate carbon originating from within the ecosystem and/or from external sources, (2.) Halophytic plants growing in these environments are very productive in converting CO into plant biomass and (3.) The biogeochemical conditions within sediments lock carbon in by slowing the decay of organic material.

Bull Island is a coastal sand spit expanding 5 km north-eastwards from the north wall of Dublin Port and 800 m in breadth at its widest point. It formed as an unintended consequence of the construction of north and south Bull walls, built over 200 years ago in Dublin Port, to alleviate silting of the shipping route. Tidal changes induced by the construction of the walls resulted in the deposition of sand and silt in North Bull Island and an actively accreting dune system that continues to this day. Bull Island's tidal wetland zones shares the capability of coastal wetlands to sequester carbon (blue carbon), immobilise and treat anthropogenic and natural contamination, create wildlife habitats and provide protection from sea-level rise (SLR) and storms.

We recently published the first study to recognise Bull Island sediments as a functioning blue carbon ecosystem (Grey et al, 2021). We investigated sediment geochemistry and provided information on the storage of organic matter, bulk sediment chemistries and anthropogenic contaminants (i.e. PAHs, Pb and Zn) across Bull Island. The overall study provided a baseline record of sediment geochemistry and the influence of urbanisation on a coastal ecosystem in a highly productive blue carbon area.

Planned research emanating from this baseline study can be subdivided into three separate but complimentary studies:

1. **What is the source of carbon in Bull Island (e.g. marine, terrestrial, anthropogenic)?**
2. **How stable/labile is it?**
3. **Incorporate data from our recently deployed data buoy (https://www.dcu.ie/predict) to understand marine inputs and sediment dynamics in the bay.**

If successful, the candidate will contribute to sediment chemical analysis that includes field trips in an unprecedented investigation of the carbon holding capacity of an Irish Blue Carbon zone.