Option Six

Project Title; Rocks of the Future: how do anthropogenic rocks form and what challenges and opportunities do they pose?

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Context

The Anthropocene is a proposed geological epoch dating from the commencement of significant human impact on, among other things, Earth's geology (Waters et al., 2016). In a geological and geomorphological context, the Anthropocene is viewed primarily through humans as agents in sculpting the landscape and creating artificial ground (Price et al., 2011). In Great Britain alone, it is estimated that a volume of artificial ground equivalent to at least six times that of Ben Nevis has been deposited by humans over the past 200 years (Price et al., 2011). As a result, this artificial ground, or deposited anthropogenic sediment, provides a marker with which to characterise the Anthropocene.

In order to be preserved as a marker of the Anthropocene for future geoscientists to look back on, this artificial ground must undergo lithification to become rock. What geological processes need to operate for this sedimentological record of the Anthropocene to be preserved? Examples of anthropogenic rocks have been documented already (e.g. Corcoran et al., 2014) and may provide insights into what anthropogenic rocks of the future will be like. What challenges or opportunities can anthropogenic rocks pose to current and future generations?

Project Aim and Research Questions

The broad aim of this project is to investigate the processes involved by which unconsolidated artificial ground becomes rock. This aim will be addressed by investigating case studies where artificial ground has already become lithified – current analogues to future anthropogenic rocks. For these case studies, the following research question will be addressed:

- What are the geological mechanisms and causes of lithification of artificial ground?
- What challenges and opportunities are presented by typical types of anthropogenic rocks?

Research Plan

Year 1: literature review; literature- and map-based survey of anthropogenic rocks, initially in the UK but with scope to extend; scoping of case study sites, including two suggested ones involving lithified slag and cement clinker deposits respectively near Glasgow; fieldwork and sampling of case study sites.

Year 2: preparation of samples (powdering and thin sectioning); mineralogical characterisation by XRD and optical petrography; geochemical characterisation

Year 3: completion of analytical component; preparation of conceptual models of formation; analysis of potential challenges (e.g. pollution) based on geochemical data; analysis of potential opportunities (e.g. CO₂ mineralisation) based on mineralogy and geochemistry.

Year 4 (if required): completion of thesis and publication

Student Background

The ideal candidate will have a good undergraduate degree in Geology/Earth Science, potentially with a masters level qualification too. Field and/or laboratory experience is advantageous.

References


*Potential case study sites of anthropogenic rocks: lithified cement clinker (left); lithified iron and steel slag (right).*