

Project title: Cities climate change strategies and natural resources

Ref: OP2415

Keywords: cities, raw materials, infrastructures, mining

One Planet Research Theme:

Climate & Climate Change | Earth System Processes | Anthropocene | Environmental Informatics

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Key Research Gaps and Questions:

1. What Climate change strategies are published by local authorities
2. How do strategies and infrastructures reduce emissions and risks in cities?
3. Do climate change actions result in higher use of natural resources?
4. What environmental and economic trade-offs should be considered?
5. What are the risks and opportunities?



Project Description: Cities around the world and in the UK develop local climate plans (Salvia 2021). Climate actions require large amounts of natural resources (e.g. sand, aggregates, lithium and cobalt) that should be sourced sustainably (Heidrich 2022). For effective local climate plans and to ensure there are no unintended consequence i.e. trade- offs between infrastructures and resources, assessment methodologies need to be developed with detailed analysis of the impacts of these strategies using e.g. Life Cycle Assessment and Material Flow Analysis (Baars 2021 and Heidrich 2022). The student will evaluate the impact of cities climate change strategies on infrastructures and natural resources.

In collaboration with cities like Newcastle, Manchester, North Tyneside the study will determine whether local climate plans represent an effective means to mitigate GHG emissions and adapt cities to climate change without compromising natural resources or geopolitical relationships. The study will consider the different sectors and scopes that are under the control of Local Authorities (direct influence) as well as Scope 3 emissions. The student will acquire innovative natural and social science tools, such as GHG accounting methodologies, geospatial tools, Life Cycle Assessment (LCA) and Material Flow Accounting (MFA), as well as the network-based interview and analysis methods. The study will advance quantitative and qualitative measures and research methodologies of the perceived risk and value of climate change adaptation and mitigation infrastructures and natural resource provisions.

The study will employ methods like: strategy analysis, emission and resource accounting (RQ1+2); infrastructure mapping and LCA (RQ3); calculating mitigation, e.g. GHG accounting linked to the Tyndall Carbon Calculator (Manchester University), and adaptation, e.g. flood defence efforts (RQ3+4), and develop/apply a risk matrix for RQ5.

References: Salvia...Heidrich, O. (2021). Will climate mitigation ambitions lead to carbon neutrality? *Renew. Sust. En. Rev.* <https://doi.org/10.1016/j.rser.2020.110253> ; Heidrich (2022). LAYERS: A Decision-Support Tool to Illustrate and Assess the Supply and Value Chain for the Energy Transition, <https://www.mdpi.com/2071-1050/14/12/7120>; Baars, J.,..Heidrich, O. (2021). Circular economy strategies for electric vehicle batteries reduce reliance on raw materials, *Nature Sustainability*. <https://www.nature.com/articles/s41893-020-00607-0>

Prerequisites: Strong analytical, mathematical and statistics skills. Engineering, natural science background; strong academic writing skills. Programming skills such as Python are advantageous.

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