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Assessing impacts of urban form on GHG emission with high-resolution spatial grids to implement nature-based solutions for carbon neutral cities

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Globally, urban areas contribute significantly to the emissions of the greenhouse gases (GHGs) which are leading to anthropogenic climate change. To achieve long-term sustainable development goals, urban regions will need to grow and develop in such a way that they can both provide a good quality of life for all of their inhabitants, and also reduce and offset their GHG emissions to reach and maintain net-zero GHG emissions.

This work aims to further our understanding of the impact of urban form and growth on GHG emissions, to identify ways in which nature-based solutions (NBS) can be integrated into urban planning to help cities reach net zero emissions while continuing to grow sustainably. We will conduct a high-resolution (1x1km) spatial accounting and mapping of GHG emissions from selected urban anthropogenic activities (residential, commercial, transportation) for Stockholm, Sweden which includes those factors relevant to and impacted by urban form (such as density, land use pattern transportation networks, green spaces) to allow for the analysis of different types of city spatial patterns and planning decisions and their implications in GHG emissions. The results will be further expanded to cities across the European Union (EU) for comparison. Conclusions will be drawn about where and how NBS interventions should be used most effectively to reduce urban GHG emissions and facilitate sustainable city growth in the future.

Keywords: Sustainable cities; Land-use; Greenhouse Gas Emissions; Nature-based Solutions