ENERGY USE OF URBAN TRANSPORT AND BUILDINGS:

A New Combined Metric

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Introduction

To implement actions to reduce the negative effects of carbon-based energy consumption calls for a good method of measuring that energy. Prior research has always considered urban buildings and transport energy costs separately. A combined energy use metric is developed at a large scale to provide better understanding of energy consumption patterns. Because commuting plays such a substantial role in energy demand, the results show a direct relationship between lower per capita energy consumption and urbanised areas, demonstrating how energy efficient urban living is.

Background

- Urban areas have been growing continuously [1] leading to an increasing carbon-related energy consumption [2]
- The rise of CO_2 and other GHG emissions results in negative consequences: climate change, air pollution, and others
- Priority: implementing strategies to mitigate the effects of the negative outcomes
- Measuring energy consumption is essential to outline strategies
- An energy use metric enables us to identify consumption patterns

Methodology

- There is an advantage to combine the energy consumption of buildings and transport due to their interdependency [3], given that people move from homes to workplaces
- Energy metric: estimate of the buildings operational energy and the commuting transport carbon footprint
- Use of freely available and reliable data published by official governing bodies [4, 5]
- Use of Lower layer Super Output Area (LSOA) geographic level
- Applied a common unit of measurement: $kgCO_2e$

Combined metric

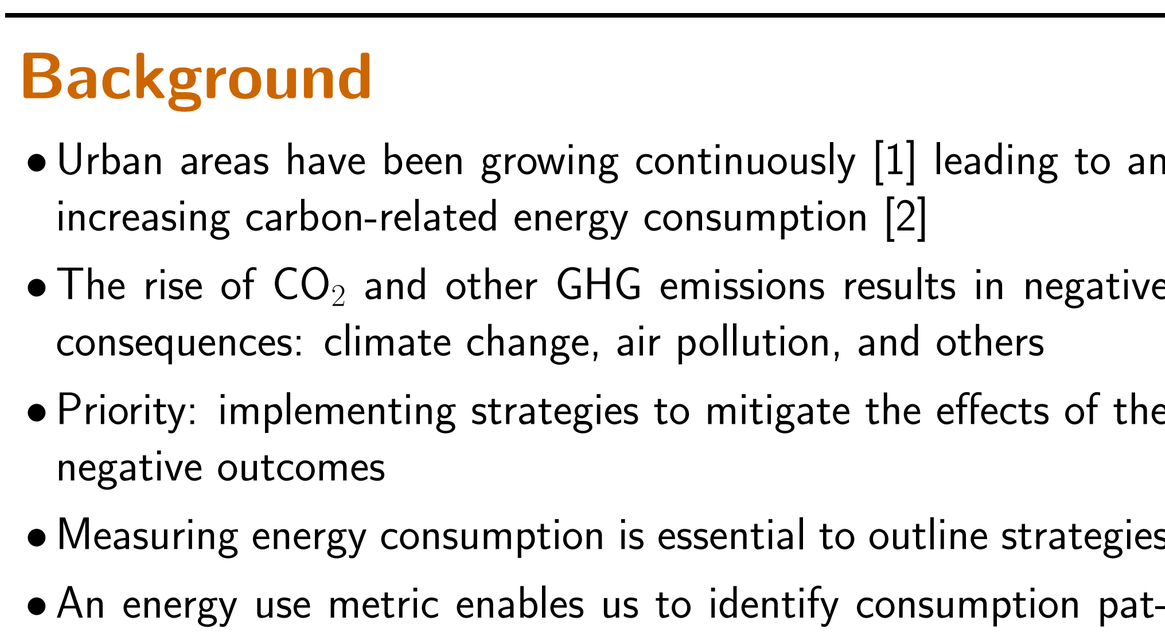

Figure 1: Energy consumption by LSOA per capita: (a) Total and (b) Buildings

- Lower per capita consumption is found in major urban areas
- Larger LSOA units generally show more energy use
- Observed a similarity between total energy and buildings alone
- Rural areas have significantly higher energy consumption

Transport analysis

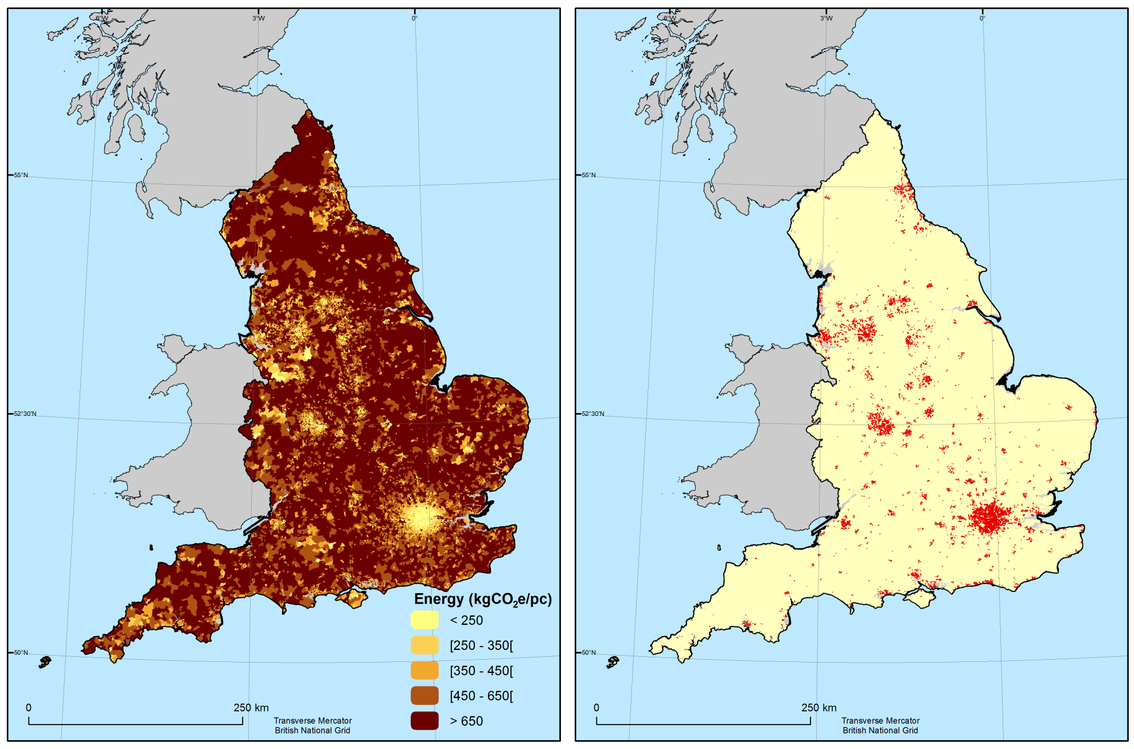

Figure 2: (a) Commuting transport carbon footprint per capita; (b) Population density $>$ 4500 prs/km^2

- Relation: low transport footprint $\Leftrightarrow$ high density areas
- Greater London: its better public transport system denotes lower per capita commuting transport energy
- Predominantly, urban areas are more energy efficient

Conclusions and future work

- Estimating energy consumption is important to provide information to design better mitigation policies
- Significant benefit from a combined energy use metric
- The simplicity of the new metric enables it to be reproduced for other regions
- Consumption patterns show that more densely populated areas have better energy efficiency [6]
- Future development: understand the relationship between energy consumption and urban characteristics

References

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