Understanding patterns of consumption-based greenhouse gas emissions in Bristol

Lena Kilian[*1], Anne Owen[2], Andy Newing[1]

[1]School of Geography, University of Leeds
[2]School of Earth and Environment, University of Leeds

January 15, 2019

KEYWORDS: Carbon footprints, consumption-based emissions, climate mitigation

Abstract
Cities have an important role to play in the UK's commitment to reducing carbon emissions. Despite consumption-based GHG emissions being higher than production-based GHG emissions in UK cities, frameworks to measure and mitigate carbon emissions continue to be better understood, more developed, and more embedded in policy for production- as opposed to consumption-based emissions. While cities have more recently begun to look at their consumption based GHG emissions (e.g. Millward-Hopkins et al., 2017; Sudmant et al., 2018), household differences in consumption patterns are not yet well-understood. Particularly in light of existing research suggesting that urban areas have some of the highest and lowest carbon footprints in the UK (Minx et al., 2013), understanding the differences in consumption and carbon emission patterns between households is significant for designing policy which effectively reduces a city's carbon footprint. Moreover, investigating differences in households' carbon footprints allows for an assessment of the impacts of infrastructure or commercial facilities (e.g. access to public transport or supermarkets) on carbon emissions.

Using Bristol as a case study, the current research will investigate household carbon emissions at neighbourhood level, and provide insight into inner-city household differences in consumption and resulting carbon emissions. For this, the current research will use a novel dataset from TransUnion, which contains consumer spending. This will be aggregated at Lower Super Output Area (LSOA) level and combined with socio-demographic information from the census. This project will explore Bristol's household carbon footprints from the year 2016.

Links between household carbon emissions and socio-demographic variables will be statistically analysed. Previous UK-based research has identified direct relationships between consumption-based GHG emissions and income, household size, education level, and car ownership (Minx et al., 2013). However, as this research was at Local Authority District level, inner-city variations in consumption and emission patterns could not be identified outside of London. In other words, the analysis of London was done by borough, resulting in the authors being unable to investigate impacts of local infrastructure as well as neighbourhood differences. The current research will expand on this and investigate links between socio-demographic variables and consumption-based carbon emissions of neighbourhoods in Bristol.

Furthermore, spatial patterns of emissions will be assessed using GIS. In addition to looking at total household carbon footprints, this research will analyse geo- and socio-demographic patterns of emissions from one sector (e.g. emissions associated with transport and mobility products, or emissions associated with food and drinks) in depth. This will provide insight into complexities of consumption patterns and into not only *how much*, but also *which products and services* are consumed across Bristol's neighbourhoods. Moreover, this analysis may provide some insight into impacts of local infrastructure on consumption behaviours and resulting emissions patterns. Thus, this research will result in an increased understanding of differences in consumption behaviours between various geo-

[*] gylk@leeds.ac.uk

and socio-demographic groups in urban settlements. This could help not only in targeting consumption-based GHG emissions, but also in predicting how emissions may change with a changing population.

The current research is positioned within a larger research project on household carbon footprints in the UK. The project will evaluate consumption-based GHG emissions longitudinally and at Output Area level. This will allow an assessment of the impacts of the 2007/08 economic recession, sustainability behaviour change policy, and local infrastructure developments on household carbon emissions. The Bristol case study, thus, presents a pilot analysis of a UK-wide project on household carbon footprints.

References

Millward-Hopkins, J., Gouldson, A., Scott, K., Barrett, J. and Sudmant, A. 2017. Uncovering blind spots in urban carbon management: the role of consumption-based carbon accounting in Bristol, UK. *Regional Environmental Change*. **17**(5), pp.1467–1478.

Minx, J.C., Baiocchi, G., Wiedmann, T.O., Barrett, J., Creutzig, F., Feng, K., Förster, M., Pichler, P.-P.P., Weisz, H. and Hubacek, K. 2013. Carbon footprints of cities and other human settlements in the UK. *Environmental Research Letters*. **8**(3), pp.1–10.

Sudmant, A., Gouldson, A., Millward-Hopkins, J., Scott, K. and Barrett, J. 2018. Producer cities and consumer cities: Using production- and consumption-based carbon accounts to guide climate action in China, the UK, and the US. *Journal of Cleaner Production*. **176**, pp.654–662.