Household final energy use footprints in Zambia - lessons learned from quantitative studies

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A recent study highlights the importance of using micro-data to better understand the relation between energy use and well-being (Brand-Correa & Steinberger, 2017). Using the average household as a unit of analysis gives a little insight towards the context of energy use. Employing micro-data in form of, for example, household surveys that contain information about individual households is therefore preferred for understanding the context of energy use depending on socio-economic characteristics and provisioning systems.

The objective of this study is to first identify what is the indirect and direct household energy use in case-study countries (Zambia and Vietnam), to then understand how do household energy profiles depend on characteristics of provisioning systems, such as urban form, dwelling type, access to facilities, ownership of appliances, as well as social contexts (e.g. unemployment, access to healthcare and education). The choice of case-study countries is one element of novelty as several studies pointed to a need for expanding research beyond developed countries (Donato, Lomas, and Carpintero 2015; Kok, Benders, and Moll 2006; Wiedenhofer et al. 2017).

The first step of the analysis focuses on household-level expenditure data from nationally representative consumer expenditure surveys (Living Standard Survey), which is mapped into Global Trade Analysis (GTAP) Multi-Regional Input-Output (MRIO) database. To quantify households' indirect and direct energy use, a final energy extension using the International Energy Agency (IEA) database is created. This extension is integrated within MRIO model.

The second step of this analysis focuses on the understanding of contextual factors, such as geography, local infrastructure and surrounding amenities in influencing the links between level and types of energy use. These contextual factors fall under the umbrella of "provisioning systems" (see (O'Neill et al. 2018) supplementary material for a description). I will map the statistical links between household physical and social characteristics and categories of energy use (both direct and indirect) for both selected countries. I will then test diverse statistical methods to study the effects of provisioning system characteristics on the energy - socio-economic relationships, resulting in the quantification and empirical testing of the broad area of provisioning systems.

The preliminary results, presented here, from Zambian and Vietnamese case-studies showcase the value of this approach and introduce the method for the next step where resulting predictors of types and levels of energy use will be used to further establish relations between energy use and basic human needs.