

19-21 de Octubre 2022 | Granada

## INTERNATIONAL CONFERENCE ON REGIONAL SCIENCE

*Challenges, policies and governance of the territories in the post-covid era*

Desafíos, políticas y gobernanza de los territorios en la era post-covid

XLVII REUNIÓN DE ESTUDIOS REGIONALES

XIV CONGRESO AACR



### EXTENDED ABSTRACT

**Title:** Emissions by Spanish municipalities from consumption differentials

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**Subject area:** S08 – An Inquiry into the Nature and Causes of the Wealth of Municipalities

**Abstract:**

Private consumption is the main responsible of greenhouse gases (GHG) and the main driver of global emissions in last decades. Urban residents are responsible for 80% of global emissions (World Bank, 2010) being the richest 10% of the population responsible for half of the world's carbon emissions. These figures show the importance of focusing environmental policies to consumers who lives in cities. However, effective measures at a city level needs to be based on reliable data about environmental footprints at the level of small geographical areas, such as cities and municipalities.

The analysis regarding GHG footprints is normally conducted at an aggregate spatial scale (nations or regions) due to data availability. The recent initiatives to construct global databases as WIOD, EXIOBASE or EORA, made possible to link household consumption with emissions by considering all the ripple effects produced by the interconnectivity of industries and the international trade flows in a global economy. These databases allow for calculating these impacts at the national level only and going deeper into greater spatial detail is not possible.

The multiregional and multisectoral models that can be estimated from these databases might be potentially used for assessing GHG footprints at the city level, but only if reliable estimates of consumptions for cities are available. Unfortunately, in most of

European Union countries official estimates of household consumptions are only available for relatively large regions (NUTS1 or NUTS2 units), and small area estimates are not produced due to lack of reliability (caused by small sample sizes) and/or by data privacy issues.

Spain is not an exception to this limitation and the consumption figures on the Spanish household budget survey, produced by INE on an annual basis with a sample size of approximately 24,000 households, are only available at the scale of Autonomous Communities (NUTS2 areas). Consequently, the analysis of household consumption for cities or other spatial units at the level of sub-regions is not possible basing on these official aggregate estimates.

The aim of this paper is to will calculate GHG footprints at a city level and districts within cities in Spain. We combine a robust approach that relates consumption patterns with GHG emissions, the so-called environmental extended input-output model, with a pioneering methodology that allows quantifying such emissions at a very detailed spatial scale based on the general maximum entropy estimator.

We apply this methodology by combining five different databases: input-output tables and environmental accounts that allow estimating country footprints; a bridge matrix that allows connecting macro and micro information; household budget surveys that provide information on household consumption; and CENSUS data that provide with geographical detail. We obtain results for Spain 2011 due to the last published CENSUS data.

Preliminary results are obtained for Spain differentiating those emissions derived from the consumption of energy goods from those derived from non-energy goods. Emissions of Spanish households by municipality show how, regardless of the type of emission, municipalities with low emission levels are found surrounded by municipalities with high emission levels within the same autonomous community (or the other way around). This information was not recognized before this study.

Highlight large differences in emissions depending on the type of consumption from which they are derived. On one hand, emissions derived from the consumption of

energy goods, we see a heavy load in the municipalities of the center and those belonging to Catalonia. Now that we have a detailed geographical level, we can observe that in the case of emissions derived from the consumption of energy goods, the capital of Madrid stands out for its low emission levels in comparison with the municipalities that surround it. Similar patterns can be found in the municipalities of Albacete, Barcelona, among others. On the other hand, when we refer to emissions derived from the consumption of non-energy goods, we find an emissions burden in the northern municipalities as well as in Madrid and its surroundings, but municipalities as Caceres and Mérida show up high emission levels compared to the rest of the municipalities within the same region. The results indicate differences within the same regions that are relevant for decision making and correct environmental formulations.

**Keywords:** Small area estimation · Emission mapping · Info-metrics and entropy · Environmental footprint · Greenhouse gases · Private Consumption

**JEL codes:** C81 · D58 · Q5 · R11