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**Cover letter for the manuscript “*The energy and carbon inequality corridor for a 1.5°C compatible and just Europe*” by Jaccard and colleagues submitted to Environmental Research Letters**

Dear Prof. Kammen, dear ERL Editors,

We here provide an examination of the corridor of possible distributions of household energy and carbon footprints for the populations of 28 European countries that satisfy both minimum energy requirements for a decent life and the maximum supply of decarbonised energy to achieve the 1.5°C Paris agreement target by 2050. We do this by constructing household energy and carbon footprints for harmonized European expenditure deciles in 2015, by combining data from national Household Budget Surveys (HBS) provided by EUROSTAT, with the Environmentally-Extended Multi-Regional Input-Output (EE-MRIO) model EXIOBASE. Estimates for a range of minimum energy requirements for a decent life, as well as estimates for the maximum available energy supply, were taken from the 1.5°C scenario literature. We show that, in 2015, the 10:10 ratio, the ratio of the top European expenditure decile to the bottom decile, was 7.2 for expenditure, 3.5 for energy and 2.6 for carbon.. These differences were largely attributable to inefficient energy and heating technologies in the four bottom deciles that are predominantly located in Eastern European countries. Adopting best technology in all European deciles would save 19 EJ per year and equalize expenditure, energy and carbon inequality. At those inequality levels, the dual goal can only be achieved through CCS deployment, large and fast efficiency improvements, plus extremely low minimum energy requirements of 27 GJ per adult equivalent (as compared to currently 130 GJ/ae in the lowest decile). When around 50 GJ/ae minimum energy requirements for a decent living and no CCS deployment is assumed, the mathematical possible inequality to also achieve the 1.5°C target becomes practically zero.

To date, as the relationship between inequality, energy and carbon continues to garner more research and policy attention (1-5), a quantification of the attainable corridor for a 1.5°C compatible and just transition in Europe is missing in the literature.

Our results are timely and significant. Achieving the Paris agreement climate target requires reductions in energy consumption and carbon emissions in Europe, achieving a maximum supply of decarbonised energy by 2050 (6). Also achieving minimum energy provision for a decent life for all Europeans by 2050 (7,8) means there is a corridor of possible inequality. We show that, while reducing inefficiencies in lower-income groups and reducing absolute energy consumption is critical to achieving climate targets, to achieve both, inequality within Europe will likely need to be drastically less in 2050. Being the first examination of this inequality corridor in Europe, based on established methods and data, our study is a seminal contribution to this area.

We provide all information to critically judge and replicate our study and for further analyses based on our results in the supplementary materials.

Thank you for your kind consideration

Sincerely,

Helga Weisz

(corresponding author) on behalf of all co-authors

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