

**Title (tentative):** Analysis of health impacts attributable to household air pollution associated with alternative futures

**Supervisors:** ¿?? (UPV-EHU) and Jon Sampedro

**Prerequisites:**

- Advanced experience in econometrics and econometric-software (ideally R)
- Panel data analysis
- Data processing, curation, and visualization (large databases)
- Spanish knowledge

**Summary:** Recent data shows that, globally, 2.3 billion people live without access to clean, modern cooking fuels and technologies<sup>1</sup>, so they use open fires or inefficient stoves fueled by kerosene, traditional biomass (fuelwood, or animal dung) and coal, which generates harmful household air pollution (HAP). This makes HAP one of the major risk factors for human health, particularly in the global South, causing around 3.2 million deaths per year in 2020, including over 237 000 deaths of children under the age of 5<sup>2</sup>. According to the World Health Organization (WHO), HAP affects human health from pre-conception to old age, leading to noncommunicable diseases including stroke, ischemic heart disease, chronic obstructive pulmonary disease (COPD) and lung cancer. Despite the magnitude of these effects, HAP and its subsequent impacts on human health are usually ignored in global scenario analysis. It is clear that scenarios with increasing convergence between developing and developed economies or the implementation of mitigation strategies will directly affect the affordability of different energy fuels/technologies, facilitating the access of lower income groups to clean energy sources. These changes in residential energy demands will have direct implications for human health associated with HAP. **The objective of this internship is to develop an econometric model to calculate future HAP and its subsequent impacts, to be incorporated into a well-reputed integrated assessment model, extensively used for global and regional scenario analysis (GCAM<sup>3</sup>).** In addition, the econometric model developed during the internship will be written as a standalone R-package, and is planned to be published in the Journal of Open Source Software (JOSS).

**Methodology:** Panel data analysis. Econometrics.

**Data:** Global Burden of Disease (GBD), the Community Emissions Data System (CEDS), The World Bank, and other sources to include different covariates (e.g., SSP database for socioeconomic variables).

**Keywords:** Household Air Pollution; panel data analysis; global scenario analysis; integrated assessment

**References (among many others):**

- Murray CJ, et al. Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet* 2020.
- Balakrishnan, K., Ghosh, S., Ganguli, B., Sambandam, S., Bruce, N., Barnes, D.F. and Smith, K.R., 2013. State and national household concentrations of PM<sub>2.5</sub> from solid cookfuel use: results from measurements and modeling in India for estimation of the global burden of disease. *Environmental Health*, 12(1), pp.1-14.
- Apte, K. and Salvi, S., 2016. Household air pollution and its effects on health. *F1000Research*, 5.

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<sup>1</sup> <https://trackingsdg7.esmap.org/>

<sup>2</sup> <https://www.who.int/data/gho/data/indicators/indicator-details/GHO/household-air-pollution-attributable-deaths>

<sup>3</sup> <https://gcims.pnnl.gov/modeling/gcam-global-change-analysis-model>