



## Technological and socio-economic solutions to reduce indoor air pollution in Nepal (SmokeFreeHomes Nepal)

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**Residential biomass combustion (RBC)** is one of the most important emission sources globally. RBC aerosol includes several particulate and gaseous compounds which are harmful to health and climate. Nepal is one of the least developed and low-income countries and most of the households in rural communities use traditional stoves. The emissions from heating and cooking activities cause a high level of health hazard to the people spending more time in the house (e.g., women and children). Overall, household air pollution in Nepal accounts for more than 18000 deaths annually.

Overarching objective of the research is to find out the most effective, techno-economic, and socially acceptable measures to reduce RBC emissions from Nepalese rural houses and thus, lower the exposure of indoor air pollutants to women and children. The research clarifies levels of indoor air pollutants and aims to reduce the concentrations by improving stove technologies and operational behavior. In addition, mitigation models and emission inventories will be developed. This project will produce information for the assessment of health and climate effects imposed by RBC emissions in developing countries. The results will be useful in the development of Nepalese emission database as well as national and provincial climate and energy policies.

Small-scale combustion aerosol research team and Indoor Environment and Occupational Health research group at University of Eastern Finland focus on work packages that cover indoor air, stove operational practices, combustion technologies and implementation. They are responsible for the emission tests of the stoves, indoor air emission and exposure measurements and for coordinating the project. Kathmandu University and Tribhuvan University will serve as partner institutions. The



Renewable and Sustainable Energy Laboratory (RSEL) at Kathmandu University is generating renewable energy knowledge, innovating designs, and contributing to mitigate climate change. RSEL is responsible for facilitating the project while leading a work package which concentrates on mitigation scenarios, policy context, and socio-economic values. The Central Department of Environmental Science (CDES) of Tribhuvan University will facilitate the development of innovative solutions to mitigate harms of household air pollution exposure and offer logistic support for study fieldwork and data collection. CDES focuses on a work package that covers outdoor air and emission inventories.

### Main publications:

Das B, Prakash B, Byanju R. Estimating emissions from open burning of municipal solid waste in municipalities of Nepal. *Waste Management*. 2018; 79:481.  
<https://doi.org/10.1016/j.wasman.2018.08.013>

Lohani S P. Biomass as a Source of Household Energy and Indoor Air Pollution in Nepal. *Iranica Journal of Energy & Environment*. 2011; 2(1):74.

Paudel D, Jeuland M, Lohani S P. Cooking-energy transition in Nepal: trend review. *Clean Energy*. 2021; 5(1):1.  
<https://doi.org/10.1093/ce/zkaa022>

Tissari J, Väätäinen S, Leskinen J, Savolahti M, Lamberg H, Kortelainen M, Karvosenoja N, Sippula O. Fine Particle Emissions from Sauna Stoves: Effects of Combustion Appliance and Fuel, and Implications for the Finnish Emission Inventory. *Atmosphere*. 2019; 10(12):775.  
<https://doi.org/10.3390/atmos10120775>

Väätäinen S, Leskinen J, Lamberg H, Koponen H, Kortelainen M, Sippula O, Tissari J. The effects of air staging and combustion air control on black carbon and other particulate and gaseous emissions from a sauna stove. *Fuel*. 2023; 331:125769.  
<https://doi.org/10.1016/j.fuel.2022.125769>

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