

Impact of Building Renovation on Indoor Particulate Matter Levels in Finnish and Lithuanian Dwellings

Judita Švaikauskaitė¹, Virpi Leivo², Tadas Prasauskas¹, Dainius Martuzevičius¹, Violeta Kaunelienė¹, Ulla Haverinen-Shaughnessy³

¹Kaunas University of Technology, Kaunas, Lithuania

²Tampere University and Tampere University of Applied Sciences, Finland

³National University of Oulu, Oulu, Finland

judita.svaikauskaite@ktu.edu

Airborne particulate matter (PM) is recognised as a significant indoor pollutant due to its complex composition and detrimental health impacts. The fine fraction of PM, specifically particles smaller than 2.5 micrometres (PM_{2.5}), has been linked to severe health issues, including fatal and non-fatal cardiovascular diseases [1]. This research study investigates the impact of energy retrofitting on variations of airborne particulate matter (PM) concentrations in multifamily apartment buildings in Lithuania and Finland. In this study, 66 multi-family buildings in Finland (Tampere, Hämeenlinna, Imatra, Helsinki, Porvoo, and Kuopio) and Kaunas in Lithuania, both retrofitted and control, were assessed for PM concentrations. PM concentrations were measured during the heating seasons of 2012-2015 and 2022-2023 and involved the measurement of indoor PM concentrations in the living rooms and bedrooms of the apartments. Measurements were taken before and after the retrofit activities, and the data was analysed to evaluate the impact of the retrofits on indoor PM concentrations [2]. The results showed that the retrofit activities impacted the PM concentrations in both countries and revealed variations in PM concentrations post-retrofit, providing critical insights into the effectiveness of energy retrofitting measures in improving indoor air quality in different building environments. Additionally, the study found that the impact of the retrofit activities varied depending on the ventilation system in the buildings. In buildings with mechanical ventilation systems, the retrofits significantly impacted PM concentrations more than in buildings with natural ventilation systems. The retrofit activities evaluated in this study can be considered effective measures for reducing indoor PM concentrations and improving indoor air quality.

[1] Chi et al. *Environ Health Perspect*, **2016**, 124(12):1840-1847.

[2] Prasauskas et al. *Building and Environment*, **2014**, Vol. 76:10-17.