ABSTRACT/SUMMARY

Community-Led Energy Auditing Data Collection and Processing to Predict Building Energy Efficiency

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The imperative shift towards achieving net-zero energy consumption demands a nuanced understanding of local energy dynamics and active community engagement. In Georgetown, Prince Edward Island, Canada (Living Lab), a pioneering research effort has been launched to employ a community-led approach of energy auditing to develop a baseline bottom-up neighborhood energy model. Residents, businesses, and building owners are engaged and trained to voluntarily participate, utilizing tools such as infrared thermal cameras, hygrometers, and questionnaires to gather critical data on energy use in buildings and thermal imaging. The research utilizes thermal imaging and computational fluid dynamics (CFD) simulations to estimate the heat loss from buildings to predict building envelope characteristics by processing community-led auditing data. Further, the predicted building envelope characteristics are validated with the Natural Resources Canada (NRCan) EnerGuide auditing dataset. The extracted information then will be integrated into detailed energy models to measure hourly demand profiles to optimize data-driven retrofitting measures improving energy efficiency and carbon footprints. Further, collaboration with governmental corporations and domain professionals will ensure the validation and contextualization of findings. This research offers practical guidance for policymakers, urban planners, and owners to do building energy labeling, and identify opportunities for retrofitting improving energy efficiency and sustainability in the built environment. Through this collaborative technique engaging various stakeholders, insights into Georgetown's energy landscape are facilitated guiding the transition toward net-zero energy status.