

Research brief

Summary of research article published in *Energy for Sustainable Development* titled: The effectiveness of household energy transition interventions in a coal-using community on the South African Highveld

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Globally, it is estimated that 2.6 billion people rely on dirty fuels such as coal and biomass to meet their household energy needs (IEA et al., 2021). The use of such energy sources has negative impacts on human health and the environment with an estimated 4.3 million annual deaths attributed to dirty energy sources (Landrigan et al., 2018). Factors such as poverty and unemployment, lack of clean energy infrastructure, and affordability barriers are some of the leading drivers of the persistent use of dirty fuels in South Africa. Against this backdrop, there is an urgent need to facilitate the use of cleaner energy sources, especially in low-income communities. The need to transition away from burning dirty fuels and achieve universal access to clean energy is a shared global target that forms part of the United Nations' Sustainable Development Goals (2030). However, the road to achieving this goal is unclear. The progress towards eradicating dirty fuels, especially in low-income areas, is hampered by region-specific socio-economic challenges together with individual preferences. Additionally, targeted clean energy intervention programmes need to be sensitive and responsive to factors that may hinder the continued use of clean energy.

In our recent study, Phogole et al. (2022), we assess the effectiveness of a clean household energy intervention designed to facilitate the use of cleaner energy sources in a coal-using, low-income community 3 to 5 years after the interventions were implemented. The study follows an Eskom-led pilot project in KwaZamokuhle on the Mpumalanga Highveld that provided households with clean energy alternatives which included low-emission coal stoves, liquid petroleum gas (LPG) heaters and stoves, and electric heaters and stoves. The houses of participating households were also fitted with thermal insulation to reduce the demand for energy for heating, especially during winter seasons when energy consumption peaks. In our study, we targeted 53 households that participated in the Eskom project (and 51 non-participant households as a control group), and a set of questionnaire surveys and visual observations were used to collect data on the households' energy use patterns, energy expenditures, and the current state and use of the

provided energy interventions. The households' satisfaction with the provided interventions was assessed using criteria that interrogated the interventions' perceived safety, durability, ability to reduce indoor air pollution, reduce energy-related expenditure, and maintain indoor cleanliness and aesthetics.

All the provided electric stoves (100%) and most of the improved coal stoves (84.6%), LPG stoves (78.6%), and LPG heaters (85.7%) were still used by the households. The electric heaters, in contrast, were used by only 46% of the households. The electric heaters fell out of favour due to their perceived poor heating capacity. Participant households also pointed to the rising costs of electricity coupled with the increasing frequency of electricity outages as some of the key factors that negatively affect the desirability of using electric appliances. Although most interventions were still operational, only 41.7% of the improved coal stoves had all their working parts in place, and this points to the poor durability of the stoves. The dual use of coal stoves for both cooking and heating may accelerate the deterioration of their structural integrity. Households that were provided with LPG appliances were largely concerned with the safety implications of using gas although all of them acknowledged the receipt of relevant user training and there were no reported gas-related incidents. Regardless of the reported limitations, households reported high levels of satisfaction with all the interventions with exceptionally high levels of satisfaction with the improved coal stoves and, most especially, electric stoves.

The installed thermal insulations were effective in reducing energy demand however, the implementation of this intervention needs to consider the quality of the house and its implication on the quality and aesthetics of the insulation (faulty roofing may cause water leakage that diminishes the quality and beauty of the insulation, especially the ceiling insulation). Additionally, the proliferation of informal housing structures may be linked to the persistent use of coal, and this needs to be addressed in pre-programme planning to ensure the sustained use of cleaner energy alternatives.

These findings need to be interpreted within the local context and acknowledging the important role of local social and economic characteristics. Nevertheless, the results of this study suggest that a successful transition away from coal requires that energy demand be reduced (for example, through insulation and energy efficient appliances), and that alternative energy carriers and appliances align with natural preferences for electricity and fuel stacking.

References

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