Energy conservation bhutan

Energy conservation bhutan

However, it is expected that this simplification will not seriously bias the analysis results because the impact will be offsetting to some extent. For example, larger savings from bigger appliances will be offset by smaller savings from smaller appliances (Gupta, 2017). Thus, the total energy-saving will be approximately the same.

The end-uses covered in the analysis are lighting, cooking, space heating, water heating, and appliances. For cooking, energy sources used are electricity, LPG, wood fuel, kerosene, dung cake, and biogas. For lighting, end-uses considered are incandescent, fluorescent, CFL, LED bulbs, and tube lights. For space heating and water heating, electricity and wood fuel are used. Appliances that are considered are fans, television, and refrigerator.

The results obtained from the study would provide a reference for Bhutan''s future energy planning and guidelines for policy-making. It would also provide suggestions for energy conservation.

Shifting from the use of fuelwood to renewable energy sources like hydropower and alternative renewable sources would enhance energy efficiency and reduce biodiversity loss and impact human health.

The integration of primary and secondary data has been used in the calculations. Most of the data used for the study are secondary data from the National Statistical Bureau''s Bhutan Living Standard Survey Report 2017 which has the nation''s data on population, household size, gender, type of dwelling, and percentage of households using different sources of energy for heating, cooking, lighting, and appliances (television, refrigerator).

The reference scenario forecasts the country''s energy demand in the absence of additional policies beyond what is already planned. Next, the efficient scenario is created by introducing efficient appliances and forecasting energy demand until 2040. Comparing the two scenarios, energy-savings from the transition from reference to an efficient energy system are obtained. Then, the overall final energy demand and savings are calculated. To check the validity of the results, calibration in the base year is carried out.

Despite data availability for the study area being challenging, this is not used to argue against modeling. Instead, it is believed that the modeling process itself instigates the process of identifying and addressing data gaps (Proen?a and Aubyn, 2009). Modeling is a very data-intensive process, and the data limitations in low-income and developing countries like Bhutan are a real limitation. Therefore, to address this problem, the LEAP model is used for the analysis because it is easy to use, flexible with data inputs, and can work with fewer data.

Energy demand is broken down by all energy end-uses under the reference scenario, and the efficient scenario is given in Figs. 2 and 3, respectively. Figure 2 shows that, at present, space heating is responsible for the highest share of final energy consumption and is further expected to grow in the future in the reference scenario. Overall, in 2040, space heating, cooking, lighting, water heating, and appliances will be responsible for 44%, 28%, 6%, 12, and 10% of final energy consumption, respectively.

As reflected in Fig. 3, energy demand in the efficient scenario is offset by fuel switching from wood to electricity. Therefore, space heating energy demand decreases compared to the base year, from 333 to 246 GWh in 2040. Figure 3 shows that there is an increase in energy demand in appliances. This is because, with an increase in income, households purchase larger appliances that consume more energy.

Over the study period, the energy demand is expected to increase by roughly 1.8 times in the reference scenario whereas it is lesser than the base year in the efficient scenario with increased energy services. In 2040, the energy demand in the reference scenario (1774 GWh) will be about 2 times larger than the energy demand in the efficient scenario (830GWh).