# eCook calculator

for CLASP Net Zero Appliance factsheets

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## Introduction

This note sets out the approach taken to model electric cooking uptake and its impacts, to fit alongside results for other efficient appliances within a series of factsheets produced by CLASP.

The objective is to produce sensible values for key impacts of transition to electric cooking for a set of countries, to insert alongside those for other appliances in the CLASP Net Zero Appliance factsheets.

The appliance targets used in the factsheets are ambitious, typically substituting efficient versions for all new devices as the stock grows, and heading for all efficiency devices in the medium to long term. The stated target for eCooking is “Fully transition to electric cooking” but the analysis has not been done.

The factsheets use 2035 and 2050 as target years. Mepsy used for other appliances is a stock model and is able to implement gradual uptake of efficient appliances year by year. That would be very challenging for an eCook model at this point, so instead the focus is on % transition of the current users. The overall methodology is set out below.

# Calculation method

## Scenarios

For a country, transition from fuelwood and charcoal to eCooking, with specified shares of those using each fuel in each of urban and rural changing. The shares can increase from target year 2035 to 2050.

The example data below are for transition of all urban charcoal users by 2035 and then add in all rural charcoal users by 2050. This scenario tackles most of the paid-for biomass fuel use. Focusing on charcoal users avoids the complication that rural and some urban firewood users have zero financial 'cost' of cooking, so the cost saving in the results table would be negative. Thus the CO2 savings possible through action on clean cooking are conservative, not including firewood use.

As a stock model, Mepsy includes a representation of the growing population, which allows consideration of uptake of efficient appliances for both existing and new users. For eCooking, the simplifying assumption is made here that new population all take up some form of clean cooking and so the transition modelled is just for the current population.

## Per country:

Impacts for country per year = Impacts per person per year * No. people transitioned in target year

No. people transitioned T = sumc(Tc) where Tc = (Popn.c * Tsharec)

Popn.c = population in each category (urban/rural, users of each primary fuel)

Transition shares in each category in target year Tsharec = scenario assumption

## Per person transitioning:

### *Electricity consumption*

Electricity consumption ECp = assumption, to be applied for every country, eg 2kWh/HH/day, or 0.5 kWh/pp/day, for full efficient electric cooking

### *Fuel consumption*

Consumption of fuel i Pb,i = calculated using the Energy Ratios for Specific Energy Use by baseline and eCook devices, as reported in Scott et al (2024) https://doi.org/10.3390/en17133318

Shares of primary fuel use for a category Perci = per country, from WHO database https://www.who.int/data/gho/data/themes/air-pollution/cooking-fuel-and-technology-database-by-fuel-category

### *Cost saving*

Cost Saving CS = $C_b - C_p$

Cost in project period $C_p = EC_p * C_{elec}$

Where:

$C_{elec}$ = Tariff per country, for likely eCooking usage. Using recent national average tariffs

Cost in baseline $C_b = Sum_{c,i} (T_c * P_{b,i} * C_{c,i})$

Where:

$C_{c,i}$ = Fuel prices, for this initial work, assumed to be single set of urban and rural prices applied for all countries. Urban: firewood in $0.2/kg, charcoal $0.48/kg; rural: charcoal $0.32/kg

The time value of money is introduced to bring future cost savings back to a common base in 2025. Consistent with Mepsy, the national discount rate is taken as the real interest rates in the World Bank's World Development Indicators dataset (indicator code FR.INR.RINR). The average of the most recent 5 years of data for each country are used.

### *GHG emission reduction*

Emission reduction EG = BE – PE

eCooking emissions $PE = EF_p * EC_p$

Where:

$EF_p$ is from standard dataset of national power sector emission factors https://unfccc.int/sites/default/files/resource/AHG-002_IFI_Approach_to_grid_electricity_consumption_v01_clean.pdf

$BE = Sum_{c,i} (EF_i * P_{b,i} * Perc_i)$



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