Access to Modern Energy Cooking Services

World Bank – ESMAP
Clean Cooking Alliance
Loughborough University

EXPLORING COSTS AND INVESTMENT NEEDS – DATA MODELING

DECEMBER 14TH 2020

Dalberg

ESMAP
Energy Sector Management Assistance Program

CLEAN COOKING ALLIANCE

Loughborough University

A Dalberg team worked closely with ESMAP, the MECS team and the CCA from 2019-20 to co-create the State of Access Report

Introduction to today's speakers

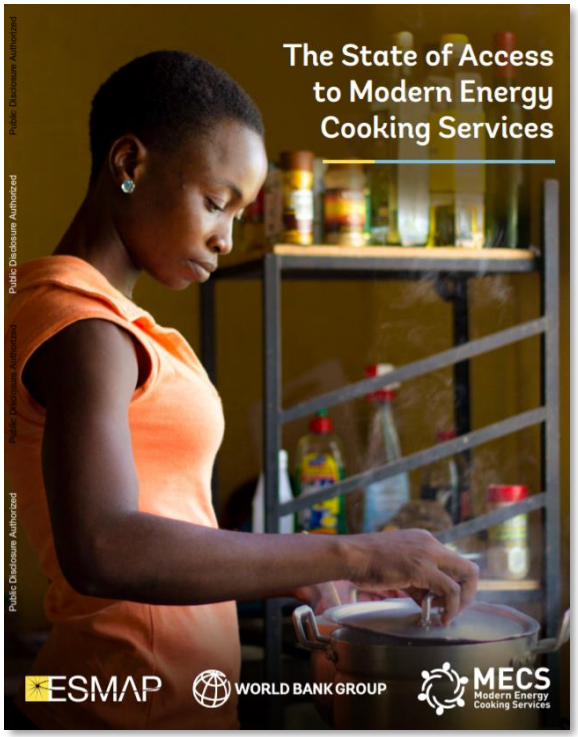
Marcos Paya
Senior Project Manager
Mexico City

Oren Ahoobim
Partner
New York City

Michael Tsan
Partner
New York City

The 2020 Access to MECS Report features novel quantitative analysis to advance understanding of the state of the sector

Key analytical outputs featured within the report



- Demand-side access modelling (access to MECS across tiers)
- Supply-side analyses (CCA partner data analysis, proprietary survey)
- Cost of inaction analysis (segmented by climate, gender and health)
- Cost of transition analyses (two distinct scenarios) — *focus of today's conversation*

Dalberg

The transition pathway analysis calculates the cost of supplying modern energy cooking services to the 2030 population in LMICs and LICs

Transition pathway analysis: methodology (1/4)

1 calculate and segment the addressable population in 2030, accounting for natural evolutions

a. *Assign MTF archetypes to non-MTF countries*

b. *Forecast countries' population growth and urbanization rates to 2030*

c. *Break down countries' 2030 urban & rural populations into primary fuel populations*

d. *Apply MECS access ratios from archetype countries to primary fuel populations, to obtain **addressable segments***

2 identify each country's least-cost-best-fit energy market trajectory/ scenario

a. *Using forecasts of countries' overall energy mix, assess whether each model country will become, by 2030, **a market that is primary**:*

- ***electric** cooking*
- ***LPG** cooking*
- ***biogas** cooking*
- ***pellet** cooking*
- ***ethanol** fuel cooking*
- ***mixed** fuel cooking*

3 identify proxy 'transition costs' for different kinds of transitions

a. *Through a desk review of high-impact modern energy transition programs, identify a **per-HH cost for two-burner transition, for each kind of transition using proxies**, e.g.:*

- *to electric*
- *to LPG*
- *to biogas*
- *to pellet gasification*
- *to ethanol*
- *to ICS*

4 multiply each addressable segment (❶) by a weighted 'transition cost' (❸) that reflects each country's energy trajectory (❷)

a. *Undertake **multiplication** of volume (addressable segment) by price (transition cost), reflecting expected country transitions (trajectories/ scenarios)*

The transition pathway analysis calculates the cost of supplying modern energy cooking services to the 2030 population in LMICs and LICs

Transition pathway analysis: methodology (2/4)

1 calculate and segment the addressable population in 2030, accounting for natural evolutions

a. *Assign MTF archetypes to non-MTF countries*

b. *Forecast countries' population growth and urbanization rates to 2030*

c. *Break down countries' 2030 urban & rural populations into primary fuel populations*

d. *Apply MECS access ratios from archetype countries to primary fuel populations, to obtain* ***addressable segments***

2 identify each country's least-cost-best-fit energy market trajectory/ scenario

a. *Using forecasts of countries' overall energy mix, assess whether each model country will become, by 2030,* ***a market that is primary****:*

- ***electric*** *cooking*
- ***LPG*** *cooking*
- ***biogas*** *cooking*
- ***pellet*** *cooking*
- ***ethanol*** *fuel cooking*
- ***mixed*** *fuel cooking*

3 identify proxy 'transition costs' for different kinds of transitions

a. *Through a desk review of high-impact modern energy transition programs, identify a* ***per-HH cost for two-burner transition, for each kind of transition using proxies****, e.g.:*

- *to electric*
- *to LPG*
- *to biogas*
- *to pellet gasification*
- *to ethanol*
- *to ICS*

4 multiply each addressable segment (1) by a weighted 'transition cost' (3) that reflects each country's energy trajectory (2)

a. *Undertake* ***multiplication*** *of volume (addressable segment) by price (transition cost), reflecting expected country transitions (trajectories/ scenarios)*

The transition pathway analysis calculates the cost of supplying modern energy cooking services to the 2030 population in LMICs and LICs

Transition pathway analysis: methodology (3/4)

1 calculate and segment the addressable population in 2030, accounting for natural evolutions

a. *Assign MTF archetypes to non-MTF countries*

b. *Forecast countries' population growth and urbanization rates to 2030*

c. *Break down countries' 2030 urban & rural populations into primary fuel populations*

d. *Apply MECS access ratios from archetype countries to primary fuel populations, to obtain* ***addressable segments***

2 identify each country's least-cost-best-fit energy market trajectory/ scenario

a. *Using forecasts of countries' overall energy mix, assess whether each model country will become, by 2030,* ***a market that is primary****:*

- ***electric*** *cooking*
- ***LPG*** *cooking*
- ***biogas*** *cooking*
- ***pellet*** *cooking*
- ***ethanol*** *fuel cooking*
- ***mixed*** *fuel cooking*

3 identify proxy 'transition costs' for different kinds of transitions

a. *Through a desk review of high-impact modern energy transition programs, identify a* ***per-HH cost for two-burner transition, for each kind of transition using proxies****, e.g.:*

- *to electric*
- *to LPG*
- *to biogas*
- *to pellet gasification*
- *to ethanol*
- *to ICS*

4 multiply each addressable segment (1) by a weighted 'transition cost' (3) that reflects each country's energy trajectory (2)

a. *Undertake* ***multiplication*** *of volume (addressable segment) by price (transition cost), reflecting expected country transitions (trajectories/ scenarios)*

Dalberg

The transition pathway analysis calculates the cost of supplying modern energy cooking services to the 2030 population in LMICs and LICs

Transition pathway analysis: methodology (4/4)

1 calculate and segment the addressable population in 2030, accounting for natural evolutions

a. *Assign MTF archetypes to non-MTF countries*

b. *Forecast countries' population growth and urbanization rates to 2030*

c. *Break down countries' 2030 urban & rural populations into primary fuel populations*

d. *Apply MECS access ratios from archetype countries to primary fuel populations, to obtain* ***addressable segments***

2 identify each country's least-cost-best-fit energy market trajectory/ scenario

a. *Using forecasts of countries' overall energy mix, assess whether each model country will become, by 2030,* ***a market that is primary****:*

- ***electric*** *cooking*
- ***LPG*** *cooking*
- ***biogas*** *cooking*
- ***pellet*** *cooking*
- ***ethanol*** *fuel cooking*
- ***mixed*** *fuel cooking*

3 identify proxy 'transition costs' for different kinds of transitions

a. *Through a desk review of high-impact modern energy transition programs, identify a* ***per-HH cost for two-burner transition, for each kind of transition using proxies****, e.g.:*

- *to electric*
- *to LPG*
- *to biogas*
- *to pellet gasification*
- *to ethanol*
- *to ICS*

4 multiply each addressable segment (1) by a weighted 'transition cost' (3) that reflects each country's energy trajectory (2)

a. *Undertake* ***multiplication*** *of volume (addressable segment) by price (transition cost), reflecting expected country transitions (trajectories/ scenarios)*

To do so, the model leans on a variety of data sources, including DHS, MICS, MTF, energy census data, UN population data, and national energy plans

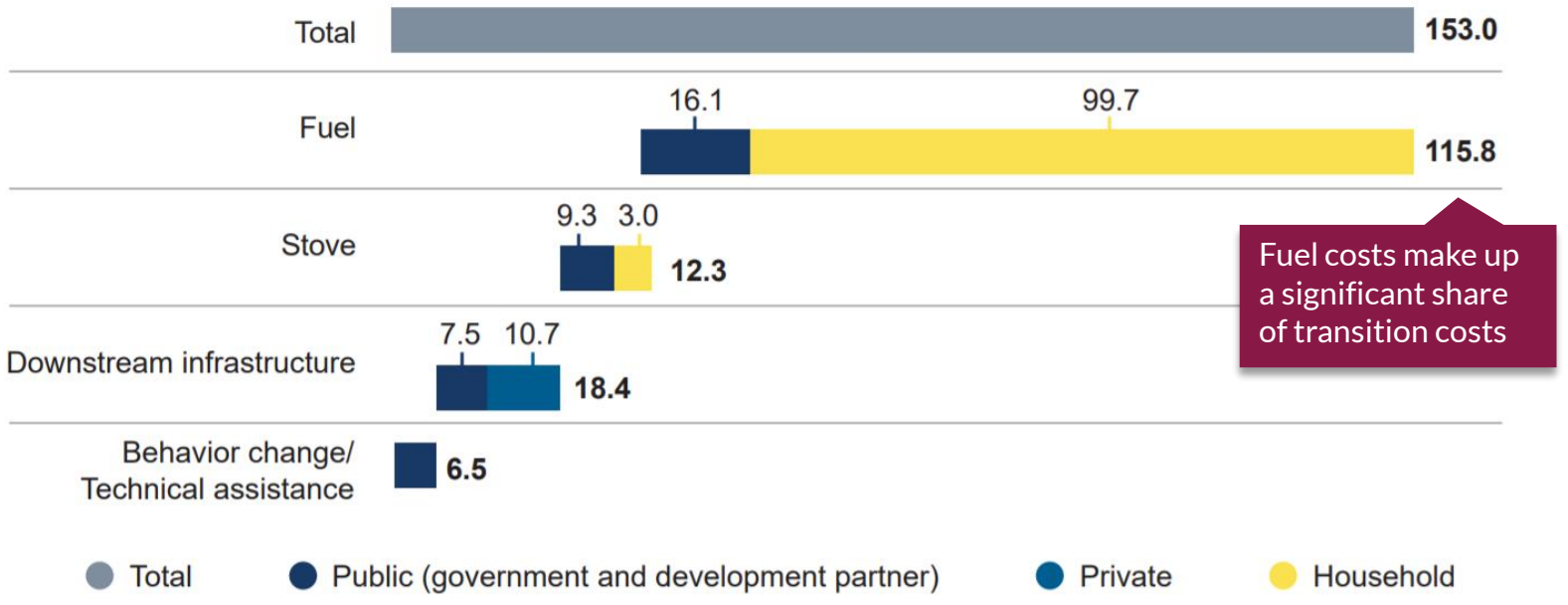
Transition pathway analysis: data sources (selection)

1 calculate and segment the addressable population in 2030, accounting for natural evolutions	2 identify each country's least-cost-best-fit energy market trajectory/ scenario	3 identify proxy 'transition costs' for different kinds of transitions	4 multiply each addressable segment (1) by a weighted 'transition cost' (3) that reflects each country's energy trajectory (2)
World Bank MTF survey data	IEA region/ country energy outlooks	World Bank / Dalberg RBF model	
World Bank dev. indicators	National energy strategies/plans	Academic studies and publications	
United Nations population data	Industry expert interviews and desk research	Industry expert interviews and desk research	
DHS survey data			
UNICEF MICS data			
Energy census data			

Under the scenario of full transition to clean fuels and high-efficiency, low-emissions stoves, transitioning would cost ~150bn per year for 10 years

Transition pathway analysis: Average Annual Cost of Transitioning Households over 10 years, by Expenditure

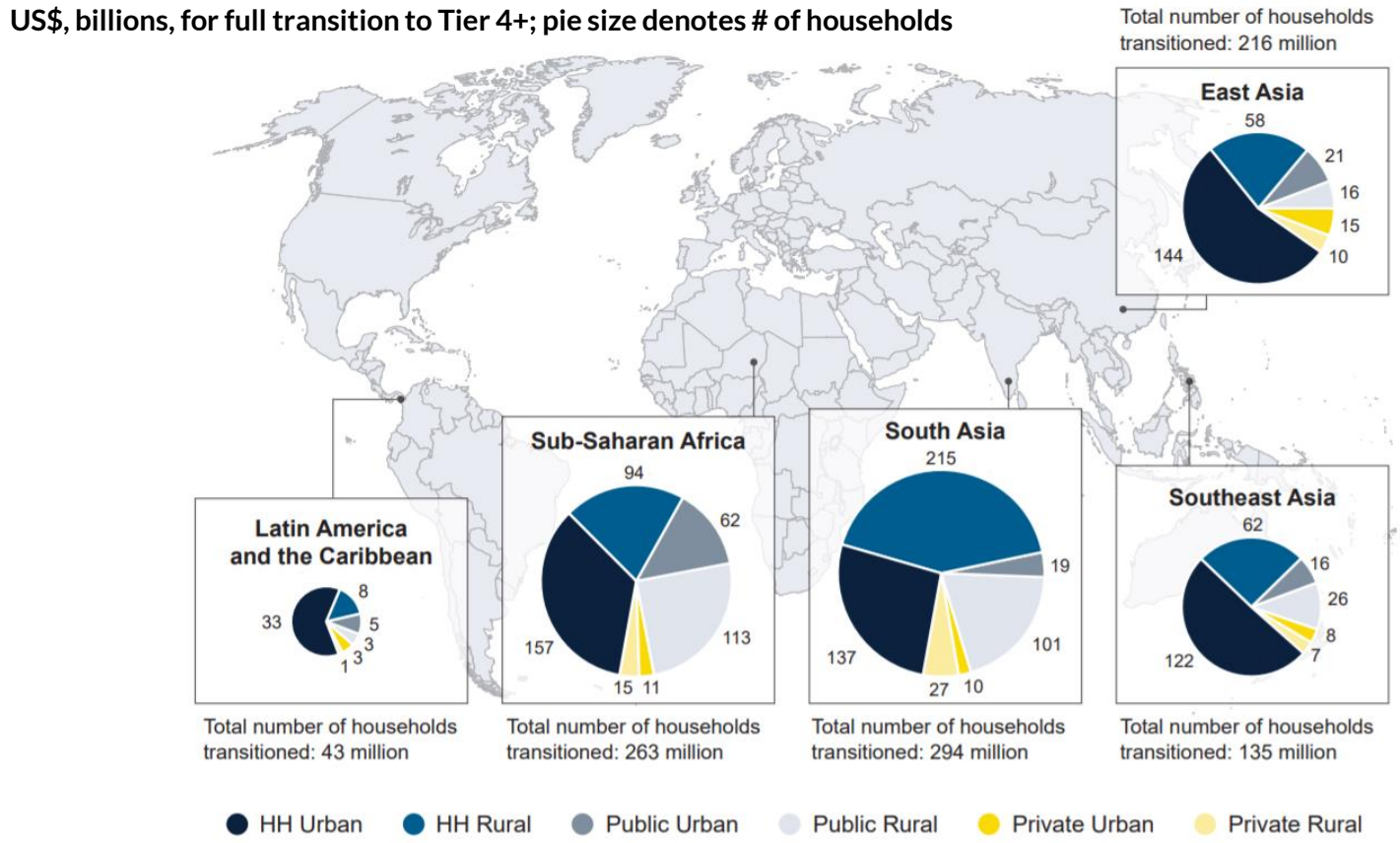
US$, billions/year, for full transition to Tier 4+



Dalberg

This cost would be shouldered by a combination of households, public and private sectors, whose contribution varies by region and locality

Transition pathway analysis: Total Cost to Transition over 10 Years, by Region, Locality, and Contributor



Dalberg

More broadly, the report and its modelling should serve as a starting point for more improved collection and application of data in the cooking space

Key data improvements suggested moving forward

Improving data collection

- **Undertaking deeper household segmentation using MTF data**, e.g. via a regional or country standardized segmentation toolkit, allowing for localized insights and costing
- **Ensuring a greater blend of quantitative and qualitative behavioral / attitudinal insights** (i.e., through human-centered design approaches)

Improving data application

- **Embedding transition insights into program design,** specifically for results-based financing initiatives
- **Developing policymaking tools** that allow for more accurate, incisive and integrated data application across the energy spectrum

Dalberg