# The imperative of an accelerated transition to modern fuels: Results from a cost-benefit analysis study

Clean Cooking Mission: A way to transition to completely smoke-free kitchens

Roundtable discussion organised by Prayas and the Collaborative Clean Air Policy Centre (CCAPC)

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#### Study to assess cost-effectiveness of transition...1

Area covered - 20 state	s, Rural-Urban Disaggregation	Health impacts	
Time period- 15 years (2015-30), Annual treatment		<ul> <li>5 Diseases (IHD, Lung Cance Stroke, ALRI, COPD)</li> </ul>	
Baseline Scenario	<ul> <li>Past adoption trends, recent policy changes</li> <li>Traditional fuel use in 2020: 25%</li> </ul>	Segregated impacts for men women, children	
	• Inautional ruel use in 2030: 35%	Fuels considered	
<b>PMUY</b> Intervention Scenario	<ul> <li>↑ LPG adoption → focus beyond connections</li> <li>Traditional fuel use in 2030: 20%</li> </ul>	<ul> <li>Traditional fuels (Biomass, Coal, Kerosene)</li> <li>Modern fuels (LPG, PNG, Electricity, Biogas)</li> </ul>	
Multi-Fuel Intervention Scenario	<ul> <li>Focus not just on LPG but other modern fuels</li> <li>Traditional fuel use in 2030: 13%</li> </ul>	Costs considered	
		Connection	
<b>SDG</b> Intervention Scenario	<ul> <li>Aggressive push for modern fuels→ SDG goal</li> <li>Traditional fuel use in 2030: 0%</li> </ul>	<ul><li>Fuel &amp; Distribution</li><li>Stove</li><li>Capital investment, if any</li></ul>	

#### Study to assess cost-effectiveness of transition...2

#### Health benefits assessment

- Integrated Exposure Response Curves → impact on DALYS (disease burden) due to exposure
- Estimation of averted DALYs based on reduction in exposure due to transition

#### Cost impact assessment

- Cumulative costs based on fuel adoption trajectories
- Costs based on consumption required for meeting all cooking needs while accounting for stove and fuel efficiencies
- Cost estimation based on 2015 prices in INR

#### Cost- effectiveness Analysis

- Measured as incremental cost per averted DALY between Baseline and Intervention scenarios
- WHO-Choice Model
  - Highly Cost- effective : incremental cost per averted DALY < per capita GDP
  - Cost-effective : incremental cost per averted DALY < 3 times per capita GDP



#### Significant Health Benefits



#### Baseline $\rightarrow$ SDG

• 53% Reduction in health impacts

#### Baseline $\rightarrow$ PMUY

- 16% Reduction in health impacts
- Accelerated transition → save lives, reduces years with illness
- Concerted efforts, significant support required
- Worthwhile social investment even if only health benefits are considered



### All interventions $\rightarrow$ highly cost-effective...



- Cost-effectiveness increases over time with increase in modern fuel use
- SDG is the costliest but also the most cost-effective intervention.



#### ...even if there is stacking with traditional stoves

- Modern fuel use highly costeffective even with 40% stacking
- However stacking also erodes away benefits
- 30% stacking in aggressive SDG scenario *comparable* to PMUY with no stacking





## Role of Improved Cook Stoves (ICS)

- Analysis with Stove meeting Tier 4 standards
- Introduction of ICS in multi-fuel scenario to assess impacts of various strategies
- ICS stoves  $\downarrow$  costs due to  $\uparrow$  in efficiency

ICS as modern fuel alternative not cost-effective

- Change in multi-fuel scenario
  - Shift of 17% of total users to ICS.
- The health benefits **drop by 20%** in spite of fewer traditional stove users

ICS to reduce stacking impact is a feasible option

- Change in multi-fuel scenario
  - 40% of stacking of ICS for traditional stove
- **4% reduction in health impact**, so ICS for stacking is useful



### **Key Insights**

- Health benefits significant  $\rightarrow$  any transition pathway cost-effective
- The clean cooking challenge  $\rightarrow$  predominantly rural
  - Accounts for 80% to 87% of health benefits, costs
  - Policies, programmes focus on rural realities, issues
    - $\downarrow$  population densities,  $\downarrow$  paying capacity,  $\uparrow$  role of socio-cultural/community norms, disparities in intra-household decision making powers
- > 80% of costs  $\rightarrow$  fuel costs in all scenarios
  - Need for reform in fuel pricing, subsidy regime
  - Connection costs and stove costs are not the crucial barrier
- Women and children are at higher risk and should be focus of policy interventions.



#### Women and children benefit

Risk ratio by gender and for ALRI (children)



Exposure rates higher than men  $\rightarrow$  relative risk to lung cancer and COPD  $\uparrow$ .

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 Policy design and focus to take intra-household inequality in benefits, incomes and bargaining power into account to ensure increased adoption

#### Is the transition feasible given India's resource constraints?

- Increased LPG consumption and oil imports
  - If incremental LPG demand met via imports  $\rightarrow$  impact on < 10% of oil imports in 2030.
  - Can meet demand via freeing up supply
    - phasing out kerosene use, adoption of better fuel efficiency norms
    - increased use of rail freight, electrification of transport
- Electricity sector investments to manage impact on peak demand
  - Significant peak load contribution- 13% of overall residential demand in SDG
  - But, electricity sector inevitably needs investments to manage flux with :
    - Increased renewable energy penetration, especially kW scale solar systems
    - Increased viability and adoption of storage technologies
    - Use of smart appliances and demand response
    - Shifting of agricultural load due to solarisation of agriculture



#### Multiple fuels, many realities, multi-pronged strategy

- Significant differences in use of tradition fuels, resource endowments across states
- Specific and varying strategies needed optimal use of resources
  - Chattisgarh, Gujarat, Punjab, Haryana, UP  $\rightarrow$  aggressive biogas push?
  - Himachal Pradesh, Kerala,  $\rightarrow$  increased electricity adoption?
  - Gujarat, Punjab, UP  $\rightarrow$   $\uparrow$  urban PNG penetration to free LPG for rural use?
  - PNG-LPG displacement can be across states as well
- Can explore options for district/block wise plans?



### Why we need a clean cooking mission

- Need for concerted efforts to ensure faster transition
  - Focus on complete fuel/ technology uptake not just connections to ensure health benefits
  - Multi-fuel approach preferred  $\rightarrow$  increases coverage , optimises resource use, investment
- Efforts needed to ensure rural transition
  - Political commitment , coordinated efforts for state/district/block specific efforts
  - Fuel- related ministries can work with MoHFW, MoWCD to address adoption barriers
  - Fuel pricing, subsidy regime change essential across sectors
- Short-term, medium and long term strategies
  - Connections initial step on long road to sustained use
  - Efforts in R&D for alternative options (ICS, solar cookers etc.) imperative
  - Need to address socio-cultural issues with appropriate medium/long term strategies



# Thank you

Prayas (Energy Group) ashwini.dabadge@prayaspune.org ashok@prayaspune.org ann@prayaspune.org Prayas (Health Group) ritu@prayaspune.org shirish@prayaspune.org vinay@prayaspune.org

