Modern eCooking; leveraging a decade of Asian electricity access gains, including mini-grids and off-grid generation and recent developments on accessing carbon finance for eCooking

S Batchelor

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Integrated Planning of modern energy inclusive of cooking
Culture, modern habits, taste and cost
Typical costs of cooking

**Electricty vs. LPG**

- **Electricity** @ 5 INR/kWh
  - Induction: 5110 INR/yr

- **LPG** @ 899 INR/refill unsubsidised price
  - Unsubsidised LPG: 7192 INR/yr
  - Subsidised LPG: 3600 INR/yr

Prices for 200 - 400 units²

Unsubsidised LPG prices are steadily increasing²

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UK aid

Modern Energy Cooking Services

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.....and cost
Table 8: Energy consumption relative to hotplate (based on median values)

<table>
<thead>
<tr>
<th>Device</th>
<th>Energy used expressed as proportion of energy used by Hotplate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modern hobs</td>
<td></td>
</tr>
<tr>
<td>Induction</td>
<td>83%</td>
</tr>
<tr>
<td>Infrared</td>
<td>92%</td>
</tr>
<tr>
<td>Insulated and automated devices</td>
<td></td>
</tr>
<tr>
<td>Rice cooker</td>
<td>77%</td>
</tr>
<tr>
<td>Frying pan</td>
<td>83%</td>
</tr>
<tr>
<td>Curry cooker</td>
<td>75%</td>
</tr>
<tr>
<td>Pressurised device</td>
<td></td>
</tr>
<tr>
<td>EPC</td>
<td>48%</td>
</tr>
</tbody>
</table>
Global electric Cooking Coalition (GeCCo)
Niche to Norm

Engagement Group Members to date

Entreprises et Organisations impliquées:
- IRENA
- ESCAP
- IEA
- Clean Cooking Alliance
- UNDP
- SNV
- Practical Action
- AVSI
- ESMAP
- GGGI
- clasp
- Social Finance
- UN Food Programme
- World Food Programme
- Climate Parliament
- Loughborough University
- THE WORLD BANK
- World Energy Centre
- UK aid
- Modern Energy Cooking Services
The challenge of integrated planning

• Local transformers and household connections

• Proportion of Renewable Generation

• Not waiting until 99% access

• Leveraging investment
The challenge of integrated planning 2

Investment required to realise clean cooking opportunity in Nigeria in 2030\(^1\), USD Mn

<table>
<thead>
<tr>
<th></th>
<th>Total cost</th>
<th>Stove cost</th>
<th>Accessories cost</th>
<th>Infrastructure cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPG</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>478</td>
<td>133</td>
<td>182</td>
<td>163</td>
</tr>
<tr>
<td>E-cooking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>83</td>
<td>83</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Biogas</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>847</td>
<td>165</td>
<td>379</td>
<td>303</td>
</tr>
</tbody>
</table>

The Central Bank of Nigeria (CBN) has a N250 billion intervention facility for the national gas expansion programme that could finance this cost.

Geospatial model output: Clean cooking opportunity (2030)
% of HHs in settlement

<table>
<thead>
<tr>
<th>LPG</th>
<th>Rural</th>
<th>Urban</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>HHs access-constrained from CC(^2)</td>
<td>23.6mn</td>
<td>13.1mn</td>
<td>36.6mn</td>
</tr>
<tr>
<td>HHs with LPG opportunity</td>
<td>1.5mn</td>
<td>2.2mn</td>
<td>3.7mn</td>
</tr>
<tr>
<td>HHs with e-cooking opportunity</td>
<td>1.3mn</td>
<td>2.1mn</td>
<td>3.5mn</td>
</tr>
<tr>
<td>HHs with biogas opportunity</td>
<td>2.0mn</td>
<td>2.3mn</td>
<td>4.3mn</td>
</tr>
</tbody>
</table>
Mini Grids

Figure 4.3: Cashflow analysis and payback period for Project 1 (a) without eCooking (b) with eCooking. Developer 1, 2023 [1].

Figure 4.2: Average normalised daily load profiles of mini-grids in Project 1 context. Developer 1, 2023 [1].
Stand alone systems

An eWant SL electric pressure cooker (EPC) connected to two 280W solar panels connected in parallel such that the current is doubled for the same voltage.

Indian Oil Corporation thermal storage solar cooker (left) [link] & Calpoly: Insulated Solar Electric Cooker (ISEC) with phase change materials (right) [link]

Image credit left: Kachione LLC
Right: An eWant SL electric pressure cooker (EPC) connected to two 280W solar panels connected in parallel such that the current is doubled for the same voltage.
Carbon Finance
Carbon finance – Voluntary Carbon Market

Figure 6: Just five countries are responsible for 95 percent of global issuances from clean cooking (in purple).
Carbon Finance - 2024 a turbulent year for cooking

undermining climate action and long-term SDG financing. Here we conduct a comprehensive, quantitative, quality assessment of offsets by comparing five cookstove methodologies with published literature and our own analysis. We find misalignment, in order of importance, with fraction of non-renewable biomass, firewood–charcoal conversion, stove adoption, stove usage, fuel consumption, stacking (using multiple stoves), rebound and emission factors. Additionality, leakage, permanence and overlapping claims require more research. We estimate that our project sample is over-credited 9.2 times. Gold Standard’s metered methodology, which directly monitors fuel use, is most aligned with our estimates (1.5 times over-credited) and has the largest potential for emission abatement and health benefit. We provide recommendations to align methodologies with current science and SDG progress.

Average price per carbon credit for clean cooking (USD)

Pervasive over-crediting from cookstove offset methodologies

Annelise Gill-Wiehl, Daniel M. Kammen, & Barbara K. Haya

Nature Sustainability, 7, 191–202 (2024) | Cite this article
Figure 3. Average national fNRB as reported by projects from 24 projects rated by BeZero Carbon. Number of projects per country is listed within the column labels.
Carbon finance – It's expensive to register.

Figure 2. Project Cycle (image credit: Nexus for Development, 2023).
Carbon finance – Its expensive to register.

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
</table>
| 1 FEASIBILITY STUDY | Responsibility: Project developer  
Cost: US$ 5,000 – 10,000  
Time: ~3 months |
| 2 PROJECT DESIGN | Responsibility: Auditor, Carbon standard  
Cost: US$ 50,000 – 75,000 (upfront)  
Time: ~6 months |
| 3 VALIDATION | Responsibility:  
Cost: US$ 10,000 – 20,000 (upfront)  
Time: 3-6 months |
| 4 REGISTRATION & IMPLEMENTATION | Responsibility:  
Cost: US$ 3,000 – 5,000 (upfront)  
Time: ~2 months |
| 5 MONITORING | Responsibility:  
Cost: US$ 30,000 – 50,000 (recurring)  
Time: ~6 months |
| 6 ISSUANCE & SALE | Responsibility:  
Cost: Varies depending on issuance volume  
Time: ~1 month |
Carbon finance – Live tracking

- Patented IoT-enabled induction cookstoves
  Remote control and data recuperation

- Auto-device lock
  Enables faster scale and locks-in device usage

- GPS & IoT Tamper warnings
  means devices are trackable and ensure data is verifiable

- Live tracking of usage data

- Automated paygo payments

- Real time usage tracking
  Precise and reliable tracking of consumption of each customer

- Third-party PayGo integration
  Payment and mobile money infrastructure in place

- Carbon credit issuance
  Automated Digital certification of usage data with Gold Standard

- Push notifications of new features & products

Gold Standard

ATEC

UK aid from the British people

Modern Energy Cooking Services
Carbon finance – Cook to earn.
Carbon finance – New platforms.
Carbon finance – Article 6 – formalising the flows.
Modern eCooking; leveraging a decade of Asian electricity access gains, including mini-grids and off-grid generation and recent developments on accessing carbon finance for eCooking

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References

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