

## CONCEPT PAPER

# IMPACT FINANCE: TOWARDS AN OUTCOMES-BASED APPROACH TO CLEANER COOKING

### The impact

Traditional stoves that burn solid fuels such as wood, charcoal and dung are used by up to 3 billion people worldwide. The use of solid fuels in these simple stoves produces high levels of air pollutants, and has devastating effects on individual health and the local and global environment. These negative impacts are well-known:

- **Household air pollution causes disease and death:** More than 4 million people die prematurely each year because of illnesses attributable to particulate emissions derived from cooking with solid fuels.<sup>1</sup> Women and children are disproportionately affected, with increased risk of stillbirths, acute respiratory infections and high blood pressure in pregnancy.<sup>2</sup>
- **Overexploitation of biomass for burning causes deforestation:** Woodfuels (and charcoal) for cooking and heating represent around 55% of the global wood harvest, and deforestation spreads in ever-larger 'hotspots' around urban centres to meet this growing demand. Deforestation in turn contributes to soil erosion, exacerbating landslides and flooding.<sup>3</sup> This over-exploitation is a textbook 'tragedy of the commons'.
- **Incomplete combustion contributes to global warming by releasing black carbon:** Estimates suggest black carbon contributes the equivalent of 25-50% of carbon dioxide warming, and that 25% of black carbon emissions globally are produced by household solid fuel burning. Around 84% of this comes from households in developing countries.<sup>4</sup>
- **Traditional cooking practices come with a socio-economic cost:** Gathering fuel is a time-consuming chore for many women and children, and its opportunity cost is the loss of hours that could be spent generating incomes for the household or in education.<sup>5</sup>
- **Inefficient stoves mean higher household spend on fuel:** Charcoal is the preferred fuel of many households and costs significantly more for its energy content than wood. Households using traditional stoves end up buying more fuel than would be required for a more efficient stove.<sup>6</sup>

The use of traditional cookstoves is the only basic household activity which drives such a complex set of negative externalities across multiple sectors: energy, climate policy, rural development and even disaster resilience. Paradoxically, this multi-faceted impact partly explains why there have been few systematic 'cross-sectoral' attempts to tackle the issue

<sup>1</sup> WHO, 'Household air pollution and health', <http://www.who.int/mediacentre/factsheets/fs292/en/>

<sup>2</sup> USAID and Global Alliance for Clean Cookstoves (GACC), 'Clean cooking to protect maternal and child health', <http://cleancookstoves.org/resources/531.html>

<sup>3</sup> Robert Bailis, Rudi Drigo, Adrian Ghilardi and Omar Masera, 'The carbon footprint of traditional woodfuels', <https://www.nature.com/articles/nclimate2491>; overview here: <http://cleancookstoves.org/about/news/01-21-2015--alliance-funded-study-clean-cookstoves-could-reduce-emissions-from-woodfuels-by-up-to-17-percent.html>

<sup>4</sup> Carl Zimmer, 'Black Carbon and Warming: It's Worse than We Thought', [http://e360.yale.edu/features/carl\\_zimmer\\_black\\_carbon\\_and\\_global\\_warming\\_worse\\_than\\_thought](http://e360.yale.edu/features/carl_zimmer_black_carbon_and_global_warming_worse_than_thought) and

<sup>5</sup> GACC, 'Gender and Livelihoods Impacts of Clean Cookstoves in South Asia', <http://cleancookstoves.org/resources/357.html>

<sup>6</sup> See analysis of biomass usage in BEST studies by EUEI PDF, <http://www.euei-pdf.org/en/project-outputs>, particularly: [http://www.euei-pdf.org/sites/default/files/field\\_publication\\_file/EUEI\\_PDF\\_Mozambique\\_BEST\\_Final\\_Report\\_Dec2012.pdf](http://www.euei-pdf.org/sites/default/files/field_publication_file/EUEI_PDF_Mozambique_BEST_Final_Report_Dec2012.pdf) and [http://www.euei-pdf.org/sites/default/files/field\\_publication\\_file/BEST\\_Biomass\\_Energy\\_Strategy\\_Tanzania\\_Final\\_Version\\_April\\_2014.pdf](http://www.euei-pdf.org/sites/default/files/field_publication_file/BEST_Biomass_Energy_Strategy_Tanzania_Final_Version_April_2014.pdf)

among the major donors to date: the negative outcomes are clear, but the collective action needed to address them stretches across multiple organisational and budget silos.

### The challenge

A new generation of improved cookstoves has come onto the market, with the potential to significantly reduce these negative environmental, social and health outcomes. But enabling their sustained adoption has proved challenging. In our analysis, the obstacles to increasing household usage of improved stoves are at two levels:

- 1) **Sustained adoption.** Households accustomed to traditional stoves often find improved cookstoves unfamiliar and complicated to use. Without high-cost consistent training and support for the usage or maintenance of their new stoves, it is difficult for clean cookstoves to take the place of traditional stoves in a household. Many households in studies ultimately revert to their old stoves.<sup>7</sup> The most efficient modern cookstoves – in either fuel usage or emissions terms – often prove to be the least popular in practice. In other words, there is a disconnect between technical effectiveness (i.e. reduced emissions / higher fuel efficiency<sup>8</sup>) in a lab setting and sustained adoption in the real world.<sup>9</sup>
- 2) **Affordability and willingness-to-pay.** Stove manufacturers are paying increasing attention to both technical effectiveness **and** usage. We have seen one or two very recent cookstoves that are enthusiastically adopted by households while also maintaining sufficient technical effectiveness to reduce emissions to a point where, for example, health impacts could be dramatically reduced. Yet these new clean alternatives – particularly forced draft biomass stoves or LPG stoves – are more expensive than traditional stoves. The low-income households who would benefit most from these stoves can be unable to afford these more efficient products, or the products themselves may not be available or supported at the last mile.<sup>10</sup> Traditional grant-based programs to bridge this affordability and availability gap have proved ineffective<sup>11</sup> and unsustainable. They have also distorted the market, in that the supply of free or subsidised cookstoves undermines market-based efforts to provide valued, aspirational products that could increase households' willingness to pay over time.

Taken together, these constraints suggest an underlying market failure. The paradox at the heart of the clean cooking challenge is that new products are emerging that can tackle this

<sup>7</sup> Brian Palmer, 'Clean cookstoves draw support, but they may not improve indoor air quality', [https://www.washingtonpost.com/national/health-science/clean-cookstoves-draw-support-but-they-may-not-improve-indoor-air-quality/2012/04/16/gIQAnjCvLT\\_story.html?utm\\_term=.58d7699cec22](https://www.washingtonpost.com/national/health-science/clean-cookstoves-draw-support-but-they-may-not-improve-indoor-air-quality/2012/04/16/gIQAnjCvLT_story.html?utm_term=.58d7699cec22)

<sup>8</sup> In practice, a highly efficient stove from a fuel usage perspective will also deliver lower emissions. This is particularly true for non-biomass cookstoves, such as those using ethanol, gelfuel, LPG or similar feedstock.

<sup>9</sup> See, for example, [https://sites.hks.harvard.edu/m-rcbg/heap/papers/hanna\\_dp41.pdf](https://sites.hks.harvard.edu/m-rcbg/heap/papers/hanna_dp41.pdf)

<sup>10</sup> J. Rosenbaum, et al. 'Understanding Consumer Preference and Willingness to Pay for Improved Cookstoves in Bangladesh', <http://cleancookstoves.org/resources/237.html>

<sup>11</sup> For example: Center for Global Development, 'Coming Clean on Cookstoves', <https://www.cgdev.org/blog/coming-clean-cookstoves>

complex, multi-faceted development problem. But the benefits of these new cookstoves are distributed across stakeholders, including:

- The benefits for **individuals**, such as improved future health outcomes or reduced time for family members collecting woodfuel
- The benefits for **local communities**, such as avoiding unsustainable exploitation of shared woodfuel resources
- **Globally**, lower rates of global warming from reduced black carbon emissions

In other words, these **positive externalities** are either not valued by, or do not directly accrue to, any of the stakeholders. Suppliers of modern cookstoves hence cannot price their products in such a way that they can capture – or ‘monetize’ – these benefits. Or, put another way, significant social and environmental value is ‘left on the table’ because of this disconnect between individual households’ willingness (or ability) to pay for improved cookstoves, locally trained supply chains that reliably deliver these technologies, and the broader development benefits of a modern, efficient solution.

### The opportunity: new ways to monetize impact

Our view is that the community working on Efficient, Clean Cooking & Heating (ECCH) needs urgently to adopt a new approach to tackling this market failure. At its heart, we need to capture the social and environmental impact of improved cookstoves in such a way that private enterprises reap the wider benefits of their products in cash terms – that is, ‘impact monetization’. This would directly support a sustainable, market-based approach to growing the sector, incentivizing further innovation and bring in socially-motivated investors.

In our view, innovations in three interlinked areas are critical to making progress:

- 1) **Remote sensing technologies which measure actual cookstove usage at household level.** It is not enough to simply measure the distribution or sales of improved cookstoves—their actual usage levels and eventual replacement of traditional cookstoves are what delivers impact. Systems like StoveTrace allow the monitoring of actual cookstove usage, at a household-by-household level, in real time, even in rural areas.<sup>12</sup> This generates data that allows the actual environmental or health impact of a modern cooking alternative to be quantified for the first time.<sup>13</sup>
- 2) **New impact monetization methodologies** are being developed to quantify in a robust, standardized fashion the health benefits of reduced exposure to particulate matter from clean cooking interventions. For example, a new Gold Standard methodology for calculating health benefits using Averted Disability Adjusted Life Years (ADALYs) aims to provide a payment mechanism for the health impact of clean cookstoves, paving the way for private investment to support increased cookstove usage.<sup>14</sup> These frameworks build on existing climate finance frameworks and methodologies – specifically through the Clean Development Mechanism – that can monetize climate benefits.

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<sup>12</sup> <http://nexleaf.org/cookstoves/>

<sup>13</sup> Complements to sensor technology are also feasible in some cases: for example, for stoves that use a specific feedstock provided by a unique supplier (such as a particular type of gelfuel or fuel pellets), stove usage could be measured via the quantity of stove fuel purchased from suppliers by each household, against a baseline of average prior fuel consumption.

<sup>14</sup> <https://www.goldstandard.org/our-work/innovations-consultations/methodology-estimate-and-verify-averted-disability-adjusted-life>



- 3) **Donor funds disbursed on an outcomes basis:** Funds such as the World Bank's Carbon Initiative for Development (Ci-Dev), which disburses performance payments based on reduced emissions, are a model for how public funds can be structured to support the emergence of a private 'outcomes market', in which enterprises compete to deliver user-friendly cooking solutions that have measurable environment, health and social impact.<sup>15</sup> This type of impact finance supports those enterprises – and only those enterprises – that generate results.

Put together, these advances open the way for outcomes-oriented donors to purchase health and environmental outcomes, on the basis of robust data and standardized methodologies, but via an entirely private sector-delivered mechanism. Outcomes-based financing can align investors' and enterprises' need for profit with environmental and health outcomes. This could encourage innovation, flexibility and adaptive management on the part of enterprises to find solutions which best meet the needs of consumers and foster an environment in which the supply of, and demand for, improved cookstoves are increasingly aligned.

The specific innovations summarized above – i.e. sensing technologies, impact measurement methodologies and outcomes-oriented impact finance – all have some track record individually. But they have yet not been combined for maximum effect. The challenge of cleaner cooking is an opportunity for funders to work in new ways.

### The way forward

We propose a 3-phase engagement to move from a **philanthropically-supported proof of concept** that would establish an outcomes-based framework to a **scaled-up phase that targets positive financial returns**.

- *Phase 1: Proof of Concept*, ~6-12 months: **Philanthropically supported**. This would pilot and iterate on the outcomes-based framework, seeking to demonstrate that deployment at scale could generate positive returns for investors. But the initial roll-out would be small-scale: 300-500 households, across 3-4 countries. See Appendix for further details of this initial phase.
- *Phase 2: Model Testing*, ~12 months: **Supported by social investment: significant risk and likely a low or negative return on investment, but with partial capital repayment**. This would launch the framework on a quasi-commercial basis using social investment with a high risk-appetite and donor outcome funding. This would be a 'real-world' test of the operational model, the business case and the impact model, with careful measurement of all elements. The highest potential countries / stoves based on the proof of concept phase would be expanded: ~1,000 households, across 2-3 countries.
- *Phase 3: Impact and Financial Returns at Scale*, 2-3 years: **Positive returns for impact investors**. This stage would scale up a model that has been de-risked by phase 2, with proven financial return and social/environmental impact. Outcomes funding would continue to pay for results, pre-financed by impact capital: ~50,000 households across 1-2 countries.

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<sup>15</sup> <https://www.ci-dev.org/about-us>



This 3-phase approach incorporating social investment is a deliberate strategy. It aims to bridge the current gap between grant-funded innovative ventures and the impact capital that is typically only available for scaling de-risked business models. At each subsequent phase we would increase our learnings and data, and continue to reduce our risk, all the while moving towards a more financially sustainable model.

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## Appendix: Next Steps

### Phase 1: Proof of concept

To demonstrate the advantages of this approach and to pave the way for a funding instrument operating at scale, we would propose an initial outcomes-based funding pilot to enable the growth of enterprises achieving good environmental and health outcomes. It could be valuable for the pilot to incorporate some or all of the following elements:

- **A strong focus on research and learning** in order to understand what works to enable cookstove enterprises to achieve both impact and financial sustainability at scale. The pilot could be used to test and iterate hypotheses about cookstove sales, ways of promoting increased usage, the effectiveness of the proposed measurement approach and the attractiveness of this approach to funders and investors. Partnerships with technical experts, particularly those well-versed in cookstove distribution and usage and measurement technologies, would be key to building a usable evidence base.
- **A ‘platform’ approach to enable scale**, as demonstrated in various social investment initiatives in the UK and elsewhere.<sup>16</sup> The pilot could work with international funders and investors keen to make multiple investments, allowing new enterprises to join the platform mid-way. The centrally-managed platform would enable economies of scale in due diligence and contracting processes, and would support market development by facilitating knowledge sharing and learning across multiple sites.
- **A sliding scale of financial incentives** for varying cookstove technologies and levels of impact, which could encourage enterprises to be increasingly ambitious in their product design and sales strategies. Enterprises might, for instance, receive a small payment for sales of cookstoves and a larger payment for enabling and measuring the sustained usage of their cookstoves. This would acknowledge a spectrum of positive outcomes while providing a significant incentive to go beyond the bare minimum.
- **An agnostic approach to pilot locations**, to avoid tying the pilot to any particular country or countries. Pilot sites could be located wherever there is alignment between the interests of enterprises and funders, as long as there are consistent ways of measuring impact. This would be an opportunity for the pilot to tackle some of the challenges of comparability (e.g. in terms of comparing the relative value of impact) across countries upfront in order to enable eventual impact at scale.

### Next steps: initial scoping work

At this stage, initial scoping work is needed to flesh out Phase 1 in more detail. This would seek to understand what shape this approach might take in practice and how feasible it is. Key unanswered questions include:

- **Understanding the market:** What does the cookstove market look like at present? Who are the manufacturers, and are there sufficient products available that deliver both technical efficiency and high usability? Where are the areas of greatest need and what is the scale of demand?
- **Incentives:** Given the multiple outcomes we are looking to incentivise and the potential trade-offs outlined above (e.g. affordability vs stove quality), what is the right way to balance incentives and avoid creating perverse incentives?
- **Pipeline:** What would potential programs look like—would they operate on a country, multi-country or regional level? Who has access to these potential deals, or what

<sup>16</sup> The UK’s “Mental Health and Employment Partnership” is a good example of a social impact platform that allows a wide range of actors to join an ongoing program, at the time of their choosing.



institutions could serve as a source of dealflow for the fund? By what criteria should we define eligibility for the fund—with the aim of prioritizing impactful projects, while excluding both commercially viable opportunities and those without sufficient impact potential?

- **Funding arrangements:** Which donors and investors might be willing to pay for this? What level of returns could the fund offer, and are these aligned with what investors would expect? Is there appetite for a larger fund, or would it be better to start with a DIB on a smaller scale as proof of concept?
- **Risks:** What are the potential market distortions that such a fund might cause? How might they be mitigated?
- **Decision making and governance:** How should different projects be evaluated? How do we ensure scalability of learning? How would the financing mechanism (whether fund or DIB) be governed?
- **Sustainability:** What might the eventual route to a sustainable market look like?