

2019

CLEAN COOKING INDUSTRY SNAPSHOT



AN INAUGURAL REPORT ON SECTOR
INVESTMENT AND INNOVATION



CLEAN
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ALLIANCE

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INTRODUCTION

The landscape of the clean cooking industry has evolved significantly since the Clean Cooking Alliance (“Alliance”) was established in 2010. Innovative business models that meet the cooking needs of base-of-the-pyramid (BoP) consumers in developing countries have emerged and are growing, with early indications that some are on a path to financial sustainability at scale.

However, access to finance remains a constraint for such emerging, early-stage companies. Debt, equity, and grant financing for clean cooking businesses tracked by the Alliance totaled USD 40 million in 2017 – significantly less than the overall USD 4 billion required annually to achieve universal access by 2030.¹ Key factors limiting investment include the unproven economic viability and scalability of business models; macro investment risks associated with these markets; and the limited availability of consumer, market, company, and investment data.

The 2019 Clean Cooking Industry Snapshot (“Snapshot”) is the latest Alliance publication on business and investment to illuminate progress toward a sustainable, private sector-led clean cooking industry. The Snapshot builds on “Financing Growth in the Clean Cookstoves and Fuels Market,”² a publication from April 2018 that evaluates historical challenges preventing the scale-up of clean cooking solutions and ongoing innovation to overcome those challenges. The Snapshot analyzes self-reported data on investment flows, business model growth, and financial performance provided by more than 40 clean cooking companies for the 2015–2017 period. This includes businesses pursuing commercial, scalable, and investable business models that serve BoP consumers. The report’s scope includes industrially-produced biomass cookstove manufacturers; producers of biomass fuel for household use; distribution companies that sell stoves with fuels such as ethanol, pellets, and briquettes; prefabricated

biogas system manufacturers and installers; and last-mile liquified petroleum gas (LPG) distributors that specifically aim to increase access among BoP consumers (e.g., through pay-as-you-go or “PAYG” solutions). This work excludes companies producing stoves that are not specifically targeted to the BoP, as well as other non-household-oriented fuel producers, larger upstream and midstream LPG companies, and infrastructure developers and operators.

Future editions of the Snapshot will aim to convey deeper insights on consumers, companies, and the growth of the market. The Alliance acknowledges and appreciates the contributions of clean cooking businesses for their trust, transparency, and continued collaboration in addressing market challenges around the world.

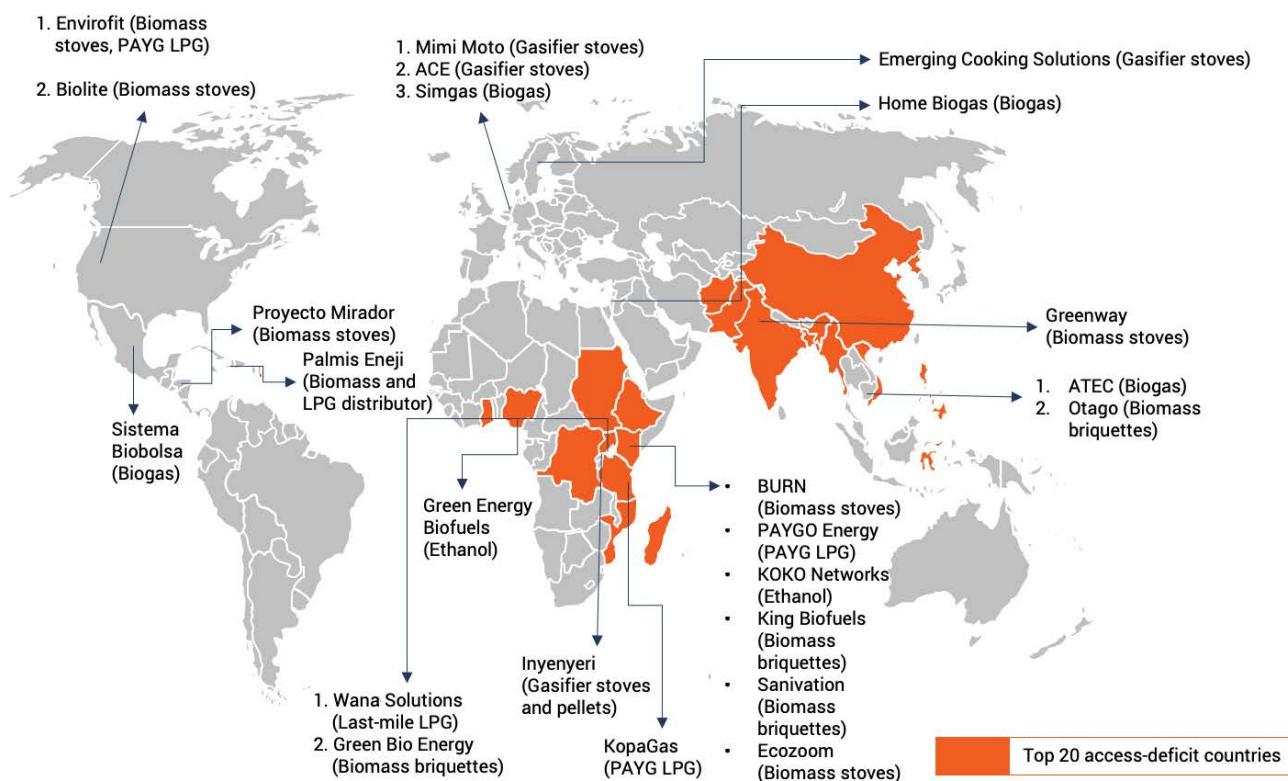
EMERGING TRENDS

A. Sector investment is growing, but is still insignificant due to relatively unproven scalability.

In 2017, investment in clean cooking companies totaled USD 40 million (based on 71 transactions in 30 clean cooking companies tracked by the Alliance). This represents a 36% increase over the total in 2016 (based on 110 transactions in 50 clean cooking companies). The total investment level in 2017 was also greater than in any of the previous five years. Nevertheless, it is still clearly insignificant compared to the USD 4 billion required annually for universal access by 2030.

Despite the significant growth of a number of companies, most sector businesses have yet to scale, i.e., become profitable by growing revenue at a pace that substantially outpaces costs and overheads. Once models are more definitively proven, the Alliance anticipates much greater investment flows to enable market expansion and replication of business models by emergent competitors.

Figure I: Selected clean cooking companies with largest investments*

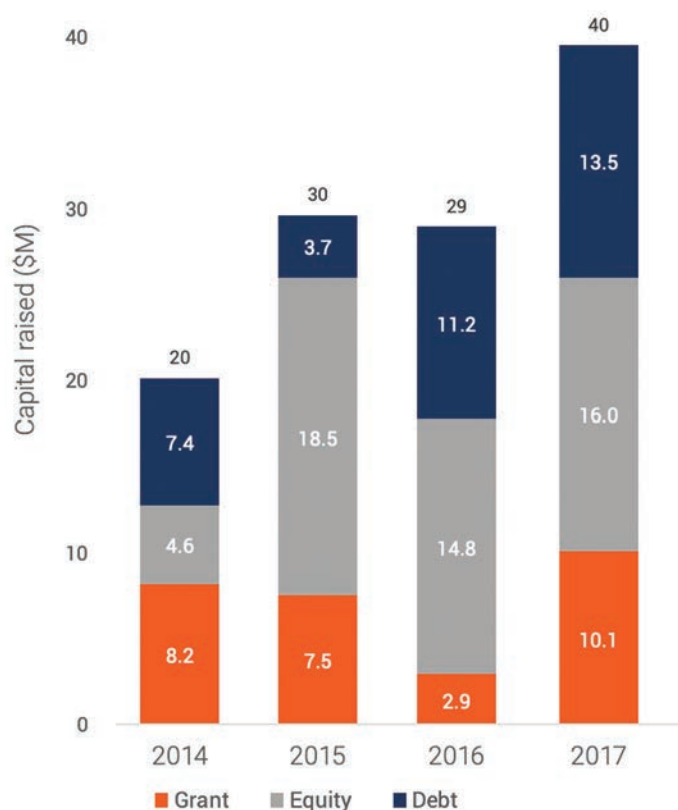


*Cumulative capital raise as tracked by Alliance based on self-reporting and publicly available information
Sources: Clean Cooking Alliance based on self-reported data by companies (2014-17); WHO.

B. Policies and entrepreneurial innovation have catalyzed investment in East Africa.

For the past several years, East Africa³ has consistently attracted a significant share of total investment flows to clean cooking businesses. In 2017, 12 companies headquartered in East Africa attracted USD 22 million in grant and investment capital. This represents more than 50% of the total tracked investment, and does not include the numerous

Figure II: Capital raised by instrument type in selected clean cooking companies



Source: Clean Cooking Alliance based on self-reported data by companies (2014–17).

companies headquartered in the US, Europe, or elsewhere that maintain substantial regional operations.

The relative success of companies in this region can be attributed to a combination of enabling policies by East African governments, a well-established charcoal market, and product category awareness and demand for clean cooking solutions as a result of past development programs. Dependence on charcoal in urban and peri-urban areas has built demand for biomass cookstoves, and generally shaped consumer dynamics with regards to cooking fuel expenditures.

The region is also a hub of social enterprise innovation and BoP-centric business models in multiple sectors, and is therefore a focus of the international impact investor community. The region is currently serving as a base for energy sector-focused funds such as Energy Access Ventures and Kawi Safi, as well as more generalist impact funds such as Novastar Ventures and Global Partnerships. The off-grid solar sector in East Africa, for example, has advanced due to the combination of social entrepreneurship leading to pioneering business models, a large number of impact investors, and conducive policies that encourage innovation and investment. And while the off-grid solar sector has benefited from dramatic component cost declines on solar photovoltaic (PV) panels and light-emitting diode (LED) lights, together with the emergence of mobile money, it is likely that innovations – such as fuel-based business models and mobile money applications that increase affordability – will be critical for clean cooking sector growth. That said, various past and potential technological innovations also hold significant promise for increasing the viability of biogas systems, metered LPG, ethanol distribution, pellets and gasifiers, electric stoves, and perhaps other future technologies.



ENABLING POLICIES DRIVING CLEAN COOKING SECTOR GROWTH IN KENYA

Kenya has been at the forefront of establishing policies that support clean cooking sector growth. Of the 20 priority countries analyzed in the World Bank's 2018 Regulatory Indicators for Sustainable Energy (RISE) report, Kenya was deemed to have made the greatest progress since 2010 based on indicators related to government scoping and planning, standards and labeling, and financial incentives.

- » In 2015, the Kenyan Government removed the excise duty on denatured ethanol as a way of increasing affordability and stimulating investment in ethanol as a cooking fuel.
- » In 2016, it removed the 16% Value Added Tax (VAT) on LPG, with a similar aim.
- » Also in 2016, the East African Community (EAC), which includes Kenya, reduced the import duty on biomass cookstoves from 25% to 10%. The reduction was expected to incentivize the entry of more companies into the region and thus increase access to high-quality, industrially-produced stoves.
- » Kenya has taken an aggressive position against charcoal by imposing a ban on production and restrictions on transportation and trading in order to stimulate uptake of cleaner and more environmentally friendly alternatives.
- » Kenya has also increased the excise duty on kerosene to discourage its use.
- » Kenya has taken a leadership role in the development of international and national stove standards, utilizing them to formulate policies, such as the import tax reduction for stoves, and to make such tax reductions applicable to stoves at or above a designated level of performance.



These efforts were encouraging indicators for many companies, particularly those importing products. However, recent policy changes have undone, or at least hindered, some of this progress:

» The import duty reduction on biomass cook-stoves did not last long; in 2018, the government unexpectedly increased the import duty from 10% to 35%, higher than the original rate, in an effort to promote local manufacturing. To further encourage local production, it also removed the duty on raw materials and inputs for the local manufacture of efficient stoves and maintained the duty on imported parts for local assembly at 10%. These changes have led numerous companies that used to import stoves with relatively significant scale and success in Kenya to halt operations or pull out of the market altogether.

» A national LPG subsidy scheme was initiated in 2017 to provide cylinders and stove packages to poor households at a subsidized price. As of 2019, the LPG subsidy program has been slow to grow due to issues of funding and cylinder supply and quality.

» Some manufacturers view the recently-passed stove standards as asynchronous with the current state of the market. However, this standard is being revised based on feedback received from manufacturers and other stakeholders.

While Kenya has demonstrated strong, private sector-led growth and a business-friendly government stance, for clean cooking businesses to succeed, policy stability and predictability are essential. Developments in 2018 clearly illustrated the unintended impacts of policy shifts and uncertainty on company growth and investment.

C. Business models that integrate fuel sales are gaining increased private sector attention.

Companies that sell stoves and associated fuels (“tool and fuel” business models) have attracted increased visibility and investment in the past several years.

Such businesses benefit from enhanced consumer data, a stronger customer feedback loop, a regular revenue stream from fuel sales, and the ability to reduce the upfront cost of stoves. These factors have significant potential to make such businesses financially viable, assuming they are able to grow and manage significant fuel supply chains. These models address historical problems associated with unused stoves, since they rely on convincing a consumer to purchase a stove and, more importantly, to use it on an ongoing basis. Beyond these intrinsic business model advantages, such businesses have greater

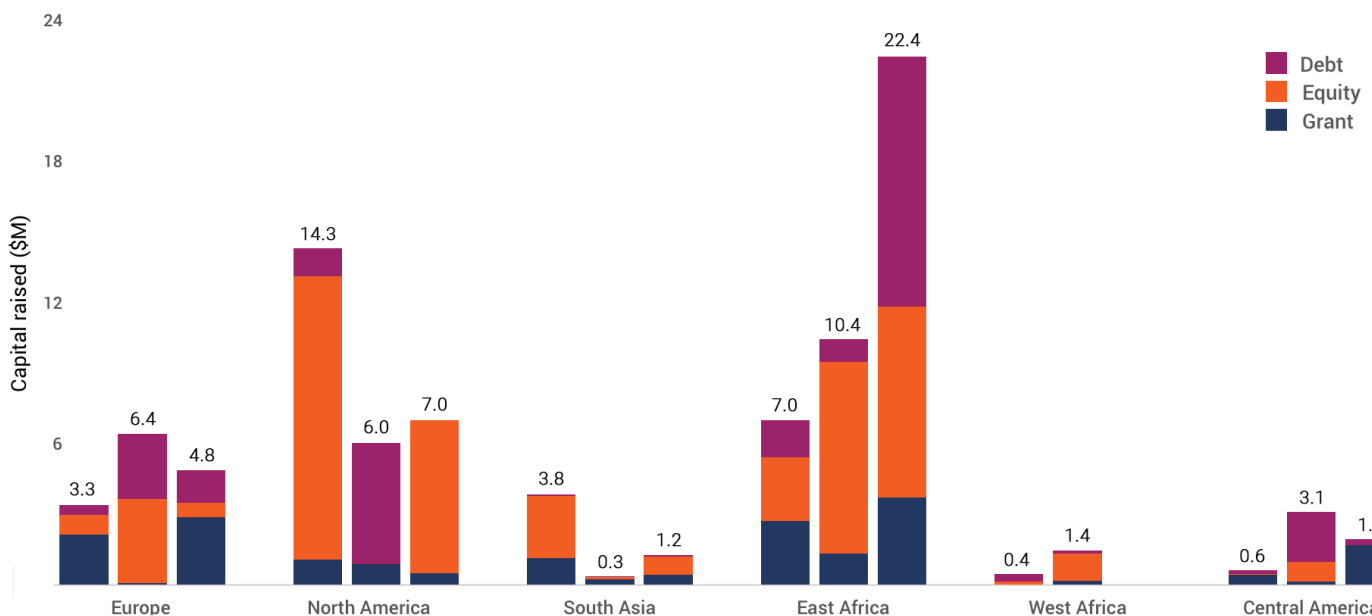
potential to quantify and verify impacts from carbon emissions reductions and perhaps even estimated health improvements.

i. Pellets with gasifier stoves

Over the past several years, a number of companies have coupled biomass pellets with cleaner, more efficient, fan-driven, gasifier stoves that achieve high-quality combustion. Inyenyeri in Rwanda and Emerging Cooking Solutions in Zambia are two examples of companies that have attracted significant attention, as well as public and private sector grants and investment. In 2017, these two companies accounted for more than 30% of total tracked annual investment globally.

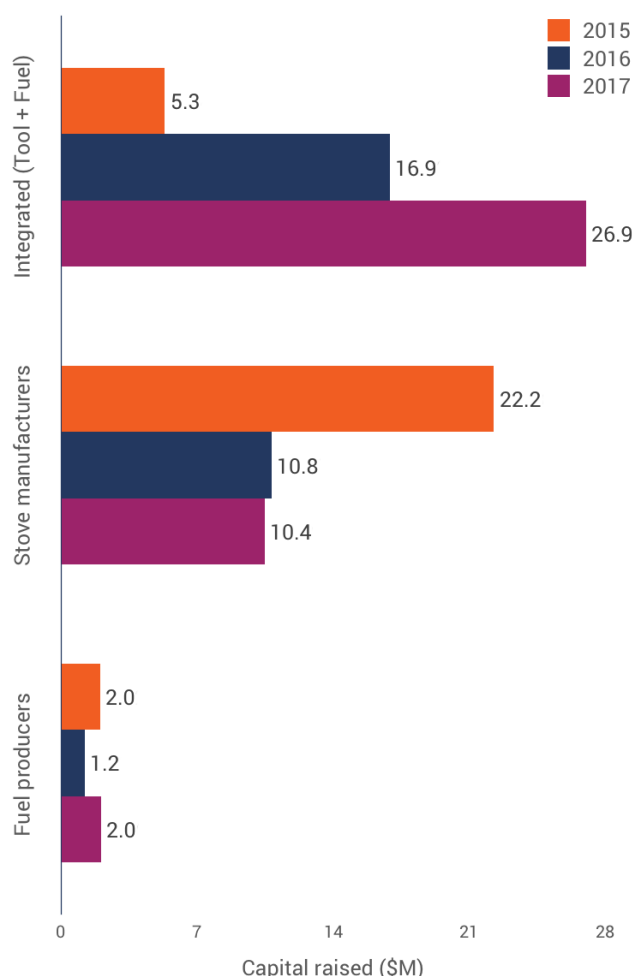
These companies typically source stoves from an international manufacturer such as Mimi Moto, or in some cases develop their own. They tend to establish local pellet manufacturing capacity to process wood or other feedstock, and to own the distribution channel through which stoves and fuel are sold. Not

Figure III: Capital raised by geography in selected clean cooking companies



Note: This graph indicates investment by location of company headquarters. Many companies based in North America and Europe operate in Africa, South Asia, and Central America. This graph does not further segregate investment data by region of operations. Source: Clean Cooking Alliance based on self-reported data by companies (2015-2017).

Figure IV: Capital raised by business model



Source: Clean Cooking Alliance based on self-reported data by companies (2015–17).

only can this model engage the local workforce in fuel production and reduce the country’s local trade deficit, but it also allows rural, cash-less customers to barter feedstock for processed fuel. By contrast, such outcomes are more difficult to achieve with fuels such as LPG or ethanol.

While these models are still at an early stage of demonstration, players in this space are already developing joint ventures and expansion plans in numerous African and Asian countries, with the aim of scaling up in the coming years. Inyenyeri secured a large carbon offtake agreement with the World Bank,

after which it was able to secure a financing facility of up to EUR 8 million from Althelia Climate Fund to provide 150,000 households with a clean cooking solution by 2020.

The key challenge such companies face is not primarily related to the stoves, but rather to being able to demonstrate the financial viability of pellet production and distribution. Given various operational challenges to date (including the cost of pelletizing technology), they have yet to profitably produce and sell pellets for household cooking use at scale.

Interestingly, there is active exploration of viable alternatives in certain markets. For example, the importation of agricultural feedstock such as rice husks may potentially drive down costs in markets where wood and sawdust are relatively expensive. Indeed, one source cites an Asian country in which the market price for sawdust is USD 0.06/kg, while rice husks can be obtained from a neighboring country for USD 0.01/kg and imported without incurring duties. Perhaps even more compelling is the potential to import dried agricultural waste (e.g., palm kernel shells) that can be burned as fuel without further processing. The reduced complexity may not necessarily incur additional costs; palm kernel shells are available from another nearby country for USD 0.07/kg – only one penny more than the in-country price for sawdust. In exchange for this modest price increase, the need for establishing pellet production capacity would be negated altogether (or at least temporarily deferred until the market is more developed).

ii. Ethanol

Another emerging fuel benefiting from companies taking a “tool and fuel” approach is ethanol. There are a number of players procuring and distributing bottled ethanol (in liquid or gel form) who continue to show promise, including Green Energy Biofuels in Nigeria, Novogaz in Haiti, and Consumers Choice in Kenya and Tanzania. However, these companies face challenges related to distribution economics and to

the viability and scale of fuel production, particularly where government policies favor local production.

One company aiming to address supply chain challenges is KOKO Networks, a technology-oriented business focused on enabling the efficient distribution of ethanol as a cooking fuel. The company is currently undertaking its initial commercial roll-out of a fuel distribution network in Kenya, with manufacturing in Kenya and India. This effort integrates learnings from various bottling-focused initiatives to scale up ethanol production and distribution around the world, including KOKO's own pilot in Mozambique. KOKO's proprietary suite of fuel distribution technologies overlays onto existing liquid fuels infrastructure operated by Vivo Energy Kenya, the company that owns and operates Shell-branded service stations and fuel infrastructure in Kenya. Vivo Energy sources ethanol locally and internationally, and uses KOKO's technology to move fuel through the last mile to a network of "KOKOpoint" fuel ATMs. KOKO manufactures high-efficiency ethanol stoves with "smart" fuel canisters that are refillable through mobile money at KOKOpoints installed inside local shops. Agent shopkeepers, in turn, earn a retail margin on fuel sales.

This approach has reduced the retail price of ethanol by as much as 50% compared to a centralized bottling system. KOKO is able to significantly undercut charcoal prices and sell fuel via daily or weekly bundles as low as USD 0.30, which aligns with the purchasing patterns of charcoal and many other BoP consumer goods. The year 2019 will be important for the company as it grows its distribution network in Nairobi and expands consumer hardware manufacturing in India. Pending success in Kenya, KOKO aims to rapidly scale up through licensing and joint ventures with strong commercial operators in other urban markets across sub-Saharan Africa. Already, local infrastructure developers are exploring the development of ethanol production capacity to meet the demand that KOKO is working to build. It's a clear demonstration of how last-mile distribution and business-to-consumer

(B2C) models are critical to justify larger upstream infrastructure investments, which should indeed follow where fuel market demand is activated.

iii. Pay-as-you-go liquefied petroleum gas

Another business model that has generated significant enthusiasm involves technology-enabled B2C distribution of LPG using PAYG financing principles. Similar to other "tool and fuel" models, PAYG LPG aims to address the three challenges of fuel distribution in BoP markets: the price of LPG versus the incumbent fuel, the quantity of fuel bundles, and hyperlocal availability.

Other PAYG Models

Numerous players in the biomass gasifier stove market are exploring PAYG models and pursuing funding to pilot or expand such an approach. One example is African Clean Energy, a manufacturer of biomass gasifiers operating in Lesotho, Cambodia, and Uganda. It is in the process of piloting a PAYG gasifier stove and a related PAYG software platform in its home market of Lesotho.

PAYG models in the biogas space are emerging as well. ATEC in Cambodia is currently piloting a technology-enabled, mobile payment integrated PAYG software and hardware system with support from the Alliance.

KopaGas, an LPG distributor in Tanzania, launched a B2C PAYG solution in 2017 on top of its existing business-to-business (B2B) distribution model. The company leases PAYG kits to customers consisting of a 15 kg cylinder, an LPG stove, and a proprietary smart meter that allows for prepayment of small quantities of gas. The meter collects fuel consumption and payment data, and once the credit balance is

depleted, the meter locks automatically and can only be unlocked by topping-up via mobile money. KopaGas offers gas at a price 20% cheaper than the average expenditure on charcoal, and enables affordable and convenient purchase increments. Integral to the model is KopaGas's smart meter and its cloud management platform, Inergy, which allow the company to share fuel margins with distribution partners in real time via mobile money. In 2018, KopaGas reached 22,000 households and raised USD 2.7 million in equity, grants, and loans to increase its operations, with funding from Acumen, KFW, Hooge Raedt Social Venture, and Saisan, a Japanese LPG company. KopaGas received technical support from the Alliance related to financial modeling and strategy development, which accelerated its fundraising efforts.

A similar model is being developed by PayGo Energy in Kenya, which raised USD 3.5 million in 2018 and USD 1.4 million in a seed round in 2017 from Novastar, Energy Access Ventures, Global Partnerships, Global Innovation Fund, and Village Capital. Meanwhile, BBOX is piloting a similar model in Rwanda, and long-time biomass cookstove manufacturer Envirofit is piloting its SmartGas™ solution in Accra and Nairobi. Envirofit plans to scale up in Kenya and expand to Uganda, Rwanda, India, and Guatemala thanks to investment from Engie, FMO, and others.

D. Among more traditional producers of stoves, fuels, and biogas systems, select players are showing signs of growth.

i. Prefabricated biogas systems

Biogas systems offer not only cooking fuel, but also a solution for fertilizer to increase agricultural yields, cold storage, sanitation, and electricity. This makes

it an attractive, all-in-one solution for smallholder farmers with ready access to feedstock, including agricultural byproducts and animal waste.

Sistema.bio, ATEC, and Home Biogas continue to make progress toward proving their prefabricated biogas technology and demonstrating scalability. These companies collectively attracted USD 6 million in investment capital and grants in 2017. Sistema.bio, which started operations in Mexico eight years ago, has sold more than 6,500 biodigester units. In 2018, the company raised USD 12 million in investment capital from Engie, Electrifi, Factor[e], Dila Capital, Triodos Bank, Alphamundi, and EcoEnterprises Fund to continue its expansion in Africa and Asia. CEO and Co-founder Alex Eaton noted, "We are very encouraged by the additional investments, support, and partnerships that have been attracted to biogas as a promising clean cooking alternative, which can support energy access as well as nine other Sustainable Development Goals."

"Brick and mortar" biogas systems have been supported extensively by donors in East Africa, Ethiopia, Burkina Faso, and elsewhere in Africa as well as in Asia. However, the industrial production of prefabricated systems pioneered by the companies mentioned above has reduced costs and improved product quality, performance, and consistency. Coupled with in-house PAYG financing or third-party loans from micro-finance institutions (MFIs), as well as aftersales service, these companies are making biogas a viable option for more consumers in African, Asian, and Latin American markets.

Speaking about the emergence of prefabricated systems, ATEC – a company operating in Cambodia – reported: "Small-scale biogas systems have not traditionally been seen as commercially feasible. But with recent improvements in commercially-produced designs in combination with PAYG or installment payment options for customers, the biogas sector is best placed to be the next big technology to follow PAYG solar."

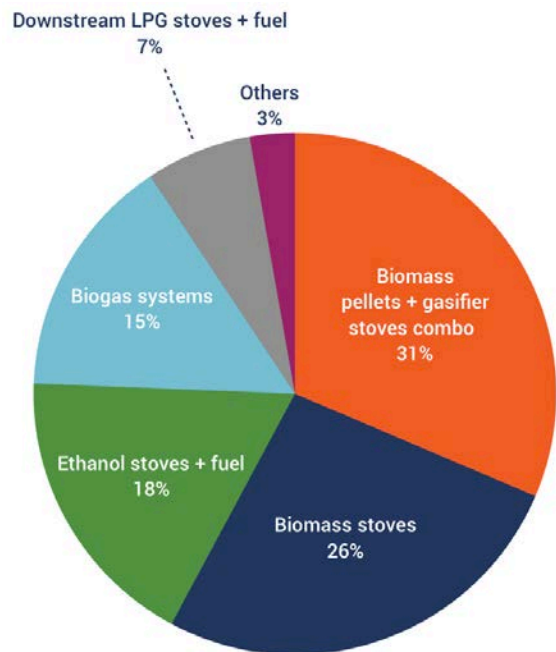
ii. Biomass cookstoves

Envirofit, BURN Manufacturing, Mimi Moto, BioLite, African Clean Energy, and Greenway are examples of companies that design and manufacture cleaner and more efficient, industrially-produced wood and charcoal stoves. Companies with these business models were the major recipients of donor and investment capital in 2015, capturing more than 90% of the tracked capital flows. With the emergence of fuel-based business models in the last several years, the overall share of capital flows to stove manufacturers has declined; nevertheless, it remains significant in the case of several companies, particularly those that have diversified to offer additional stove types or entirely new product lines.

Envirofit — the largest biomass cookstove manufacturer in terms of units and revenue — has expanded by launching a new PAYG LPG solution using smart meter technology, while BioLite and Greenway have diversified: BioLite into off-grid solar products and Greenway into televisions and other home appliances. BURN and Envirofit are somewhat unique cases in that they have developed efficient, medium-priced biomass stoves and installed in-country industrial-scale manufacturing capacity. BURN has established its brand through extensive advertising in Kenya, where the market is already highly sensitized to clean cooking as a result of many years of development interventions. The resulting debt and equity investment by numerous corporate, development finance institution (DFI), and impact investors has allowed both BURN and Envirofit to demonstrate consistent and robust growth over the last five years, as well as to develop innovative new products with a range of local and international partners. BURN is now beginning a concerted international expansion strategy, while Envirofit has offices and distribution in East Africa, Asia, and Latin America.

BURN CEO Peter Scott shared that “BURN is raising upwards of USD 10 million to expand our Kenya factory, launch into new African markets, and expand

Figure V: Capital raised by technology/fuel type in 2017 (USD 40 M)



Source: Clean Cooking Alliance based on self-reported data by companies (2015–17).

our product mix across a range of biomass and non-biomass cookstove products.” With the increasing establishment of tariff and tax regimes that favor local production in Kenya, how such a model focused on locally-based production of higher-quality industrially-produced stoves will be replicated in other markets — particularly where lower-priced artisanal products remain the favored incumbents — is an outstanding question.

iii. Char-briquette manufacturers

In most markets, char-briquette manufacturing remains small-scale due to inefficient, artisanal, or semi-mechanized production processes and under-resourced businesses. The result is inconsistent and poor product quality that constrains demand versus the incumbent charcoal. One outlier is Singapore-based holding company OTAGO, operating as Khmer Green Charcoal in Cambodia. The company, which was formerly known as Sustainable Green Fuel Enterprise (SGFE), has developed in-house, proprietary production processes and technology, including top-lit

updraft driers to dry briquettes more efficiently than the sun-drying method used by many companies in sub-Saharan Africa. Such innovations allow OTAGO to manufacture briquettes at a rate of 100 tons per month, meeting its robust product demand in Phnom Penh as well as in export markets such as Japan and Europe – an indication of its very high product quality. Given the company’s growth and pioneering model, OTAGO is now receiving Alliance support to secure financing for further expansion through the development of a state-of-the-art production facility in Cambodia (production capacity of 600 tons per month) as well as a franchising model to partner with local companies in several sub-Saharan African markets.

E. Select companies have begun to secure commercial capital.

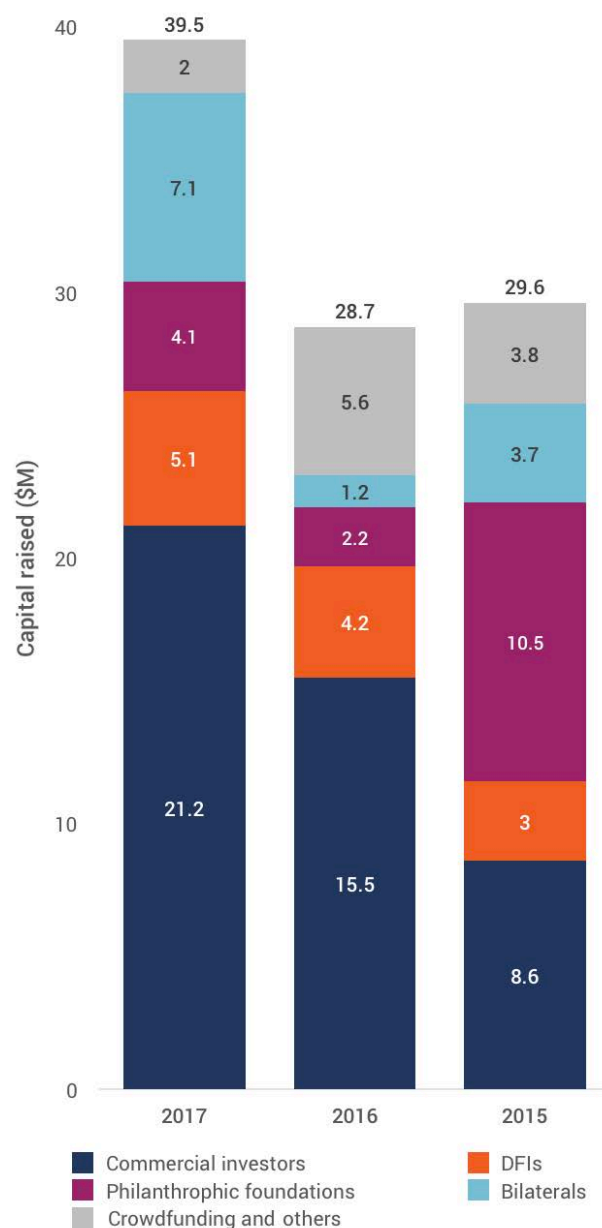
Historically, sector funding was highly impact-focused and often came in the form of grants. However, there is now interest in certain models from more commercially-oriented investors, including banks, family offices, and venture funds. An estimated USD 21 million in commercial capital was invested in 2017, representing more than 50% of the total. Unsurprisingly, these investments have been highly concentrated, with 90% directed to three companies. One of them, KOKO Networks, has raised a significant amount of capital from commercially-oriented, Africa-based investors – a unique achievement in a sector otherwise dominated by Western, concessional impact investment capital.

Multilaterals, bilaterals, DFIs, foundations, and other concessional capital providers continue to play a key role in de-risking business models and technologies; in 2017, they contributed USD 16 million, roughly 40% of total funding. In addition, many donors continue to channel meaningful amounts of funding (not reflected in Alliance figures) toward market-oriented but smaller-scale businesses producing stoves in an artisanal or

semi-mechanized manner, as well as to non-market-based approaches like philanthropic efforts, and to government-driven initiatives that leverage private sector involvement to varying degrees⁴

There was a relatively consistent split of grants versus debt and equity investment throughout (2012–17) with debt and equity each contributing around 40% of total capital each year and grants making up the rest.

Figure VI: Capital raised by funder type



Source: Clean Cooking Alliance based on self-reported data by companies (2015–17).

F. Fuel-based models promise higher growth than biomass stoves, but remain nascent.

Ten sector-leading biomass cookstove manufacturers generated average revenue growth of 6–8% per annum in 2016 and 2017. Despite continued consumer awareness raising and market-ing, and even expansion to new markets, such modest levels of growth are likely linked to relatively stagnant investment levels. Looking further back in time, in 2015 there was much more robust growth of 62%, presumably driven by a more vibrant carbon finance market and government-led subsidized distribution schemes. The decline in carbon prices in 2014–15 affected the growth of cookstove manufacturers whose models were profitable only with the addition of significant carbon-based subsidies.

A small but growing universe of six companies developing “tool and fuel” models across sub-Saharan Africa, Asia, and Central America have experienced inconsistent revenue growth, from which conclusions cannot yet be drawn. This is a function of their being early-stage and of continued experimentation with regards to both production and distribution approaches. These businesses generated negative 32% in revenue growth in 2016, but this has since jumped to positive 34% in 2017.

Four prefabricated biogas companies with operations in more than 15 countries in Latin America, Africa, and Asia saw healthy growth of 154% and 37% in 2016 and 2017, respectively. Unfortunately, one of the market’s first movers, Netherlands-based SimGas, was forced to file bankruptcy in late 2018. However, as this market is still very early-stage and companies are just now integrating PAYG technology and in-house financing solutions, the Alliance anticipates continued growth within the sizable consumer segment for which biogas is a practical and desirable solution.

Figure VII: Selected list of investors in the clean cooking sector (2015–17)

Impact and Commercial Investors



Public Sector Funders



Private Foundations



Multilaterals and DFIs



Crowdfunding Platforms



Source: Clean Cooking Alliance based on self-reported data by companies (2015–17).

G. Microfinance institutions and off-grid solar companies are emerging as clean cooking distribution channels.

Increasingly, companies with existing routes to market and consumer financing products, including off-grid solar companies (OGS) and MFIs, are serving as commercial distributors of efficient biomass cookstoves and other clean cooking solutions.

Among 10 manufacturers in 40 countries, commercial distributors account for 67% of their reported sales volumes. Leveraging existing distribution channels has the benefit of vertical disintegration and reduction of investment requirements and operational complexity for manufacturers. Direct sales and retail stores contributed 25% of volume, with the remaining 8% from non-governmental organizations (NGOs) and government programs. The increased share sold through commercial distributors is a positive shift among manufacturers who, often out of necessity, had previously pursued non-market-based NGO or government distribution, despite the risks of market distortion.

Fenix International, an off-grid solar distributor in Uganda, offers one example, having partnered with EcoZoom,⁵ whose stoves are “the most highly preferred by customers.” Specifically, “EcoZoom’s stoves are over 70% more efficient in terms of fuel usage, reduce emissions over 50%, and result in up to 20% faster cooking times.”

Another example is M-KOPA in Kenya, which offers expansion products to its solar home system clients. M-KOPA reports: “Energy-saving stoves have been the highest seller to date. The locally-manufactured clean burning stoves use sustainable fuels delivering additional savings to households. The stoves use 50% less resources while cooking twice as fast – delivering annual savings to customers of KES 11,480.” These annual savings (of approximately USD 115) are significant, equating to more than twice the cash purchase price of the stove itself.

The growing shift to commercial distributors, with their built-in markets and customer financing options, is a promising trend for clean cooking solutions. Affordable debt for the working capital that distributors need to expand their cookstove business is likely to be a key driver of continued growth, along with technical assistance to enable distributors to source the products their customers want.

Figure VIII: Sales growth by business model



Source: Clean Cooking Alliance based on self-reported data by companies (2015–17).



H. Fuel type may impact cookstove margins, but does not necessarily imply viability.

Manufacturer margins on cookstoves, based on reporting for over 25 product models, show that forced-draft gasifier stoves and wood stoves earn margins around 35–37%, versus 25–30% for charcoal stoves. Higher competition among charcoal stoves is one factor likely at play, perhaps in addition to the fact that no clear market exists for fuelwood. It is, and will continue to be, challenging to replace traditional wood-burning stoves with cleaner and more efficient models until there is a financial cost and market price applied to fuelwood, thus making more efficient combustion financially attractive for households. The lack of a price on fuelwood in many markets is likely contributing to low sales volumes for wood stoves, and perhaps the higher margins.

Figure IX: Manufacturer product margins

	Charcoal	Pellets	Wood
Cookstove models (# of models)	7	8	11
Average revenue/unit (USD)	43	45	25
Average cost/unit (USD)	31	29	16
Margin	28%	36%	36%

Source: Clean Cooking Alliance based on self-reported data by companies in 2017.



CONCLUSION

It is still early days but there are reasons for optimism, including an evolving market.

In April 2018, the Alliance and Accenture published a report outlining challenges that have historically prevented clean cooking solutions from scaling and companies from becoming financially sustainable. Lack of awareness, unaffordability, and in many cases insufficiently compelling products have constrained demand. The economics of reaching BoP markets can be complex in any context, and the logistics of delivering bulky stoves and regularly supplying cooking fuel only exacerbates these challenges. The lack of data and transparency with regards to consumers, technologies, companies, and investment transactions has not helped the private sector prioritize investment in this space.

However, the report also illustrated notable positive shifts occurring in certain markets around the world. Technological and business model innovation is increasingly benefiting from more strategic public-sector engagement, which aims to accelerate commercial approaches with investment potential. The industry is moving toward sustainability and scale, based on lessons learned from many past failures.

While historical efforts have often been philanthropic in nature and focused on the poorest, rural consumer segments, commercial efforts today take a more pragmatic approach. They are often strategically serving rapidly-expanding, lower-middle income

consumer segments in urban and peri-urban settings, while also targeting countries conducive to private sector investment. This has the benefit of establishing economies of scale, better resourced companies, larger and more commercial investment flows, and more rapid and game-changing innovation. If clean cooking solutions are to truly scale throughout developing countries and achieve the significant social, environmental, and health impacts that are possible, models and technologies must be proven in “easier contexts” first. A more substantial and established private sector can then be incentivized to expand and serve more challenging consumer segments and countries through targeted subsidies.

As in other markets, the capital, innovation capacity, and sustainability possible through private sector investment may not actually imply an impact tradeoff, but rather generate greater impact and scale than most philanthropic approaches. It is important to recognize, however, that commercial activity will not be able to reach a meaningful portion of the unserved in the foreseeable future. This is the case for clean cooking products, electricity, and other solutions which straddle the public and private sectors. It will be up to governments to ensure inclusion, but hopefully with the benefit of being able to leverage rapidly enhanced private sector innovation.

The Alliance is increasingly complementing its efforts on public advocacy, standards development, and impact research with more extensive and robust private sector support, business-oriented technical assistance, and rigorous market data. This report reflects a commitment to shed light on successes and challenges as the sector continues to evolve toward a clean cooking industry at scale.

While still in its infancy, private sector investment in clean cooking solutions for the BoP is beginning to demonstrate the ability to stimulate important innovation. Leveraging the foundation laid over the

past 10 years – including standards and testing protocols, behavior change and awareness campaigns, and public advocacy – the sector has both come a long way and faces a long road ahead. The products are more valued by consumers, companies are more professional, public sector support is more informed, and the potential for impact is growing. Combined with urbanization, poverty reduction, and financial inclusion, the clean cooking sector is poised to transition from a long-standing development challenge to a market opportunity in the years to come. The Alliance looks forward to continuing to work with many partners across the sector to accelerate this evolution.

APPENDIX

Methodology

For the 2019 Clean Cooking Industry Snapshot, the Alliance used self-reported data on investment and financial performance from clean cooking companies. Investment data has been reported by over 100 companies for the period from 2012 to 2017. Financial performance data has been reported by 40 companies for the period from 2015 to 2017. This self-reported data has been supplemented with publicly-available data, including press releases and news articles. The annual self-reporting since 2012 has served as an important database to track sector progress. Partners voluntarily submit their data online, with technical support from the Alliance.

Clean cooking businesses reporting to the Alliance include:

1. Biomass cookstove manufacturers, including industrial and semi-industrial producers
2. Producers of biomass fuel for household use
3. Companies which combine stove sales with fuel such as ethanol, pellets, and briquettes
4. Prefabricated biogas system companies
5. Last-mile LPG distributors whose technology or business model intends to increase access among BoP consumers, e.g., through PAYG solutions

Companies producing stoves which are targeted for recreational markets, other non-household-oriented fuel producers, larger upstream and midstream LPG companies, and infrastructure companies and developers are excluded from the scope.

As a “snapshot”, this report is meant to provide an abbreviated understanding of a situation based on a particular range of time. As such, the data may not be representative and there will be inherent gaps and limitations around the depth, scope, and rigor of information. The company data that was received and tracked was rich in providing insights but not robust or consistent in quantity or geography. This also illuminates the need to develop better and smarter data sources, tools, publications and informational resources that will increase transparency into markets, technologies, business models, enterprises, consumers, and impacts. This type of market intelligence is an important catalyst for stimulating investment and sector development.

Data Consistency and Gaps

The voluntary nature of the self-reporting survey comes with challenges in data consistency and completeness. Some longstanding partners have reported every year, while others have been less consistent. New companies have entered the market, while others have downsized or ceased operations. As the Alliance's partner base grows, there are new respondents each year, not all of whom are just beginning operations. There are also companies that have not reported each year. Yearly variation in responses suggests that much sector activity is unreported every year, even among Alliance partners. For 2015–17, the Alliance received data from over 40 companies and supplemented it with publicly available data. This report relies only on reported data; hence the investment and financial performance data of many companies are not captured.

Each survey response has been carefully reviewed to ensure completeness and, to the degree possible without engaging in any due diligence, accuracy. From this and other Alliance knowledge, the report's statistics and narrative were developed. Though every effort is made to gather complete data from key companies operating in the Alliance's focus countries and beyond, there are always unavoidable gaps in reporting. These gaps and strategies to address them are described below. Additionally, several assumptions have been made while analyzing the data; they are also listed below.

Data Gaps

i. Regional Gaps

For 2015–17, far more data has been reported by Africa and South Asia-based companies (17 and

11 companies, respectively) than by those based in Central and South America (two companies). In addition, the Alliance received reports from 10 companies operating in multiple regions across Asia, Africa, and Latin America. China and a number of other relevant Asian countries are almost completely absent. The Alliance has attempted to acknowledge and account for this regional bias in its reporting and narrative. The report excludes China in the analysis altogether, notwithstanding the fact that some of the companies operating in other regions are designing and distributing products manufactured in China.

ii. Gaps in Financial Performance Data

Data on the financial performance of sector companies remains limited, and in many cases inadequate to draw substantial conclusions. Understandably, many companies are reluctant to provide sensitive information when it is not under consideration for an investment or grant. This is particularly true in the early stages of growth, when sometimes large amounts of grant money or even debt or equity have not produced commensurate business growth. That said, the Alliance has received consistent, reliable, and meaningful annual data from 20 companies. Accordingly, all analysis of financial performance has reflected this universe of companies.

Sales data collected for biomass cookstove companies from 2015 to 2017 is heavily biased by one large manufacturer whose share of revenues is >50%. However, analysis shows that the revenue growth trend, even excluding this manufacturer, remains consistent.

iii. Gaps in Investment Data

Based on self-reported data, East Africa has attracted the most significant share of investment from 2015 to 2017. While this may be influenced by the Alliance's large regional network, based on discussions with those with extensive knowledge and networks across other regions, the Alliance discerns that there is

greater private sector activity in the region than in others where NGO and government-led initiatives are more prominent.

Data Analysis Assumptions

i. Investment Data

Annual investment data is based on reported investment flows in each year and is not adjusted for inflation.

Investment data is reported at the firm level. Several enterprises have additional, non-clean cooking-oriented business activities. The Alliance has not attempted to segregate investment data by business line. However, all companies in the analysis are primarily focused on clean cooking, with the majority of their sales from clean cooking products.

For classifying the investment's "funder type," the direct investor has been considered relevant. For example, a philanthropic foundation making a direct investment in a business is reflected as a "philanthropic foundation." An investment of capital from a "philanthropic foundation" that has invested as a limited partner in a fund managed by an "impact investor," which has then invested in a business, would be reflected as "impact investor."

Investment data includes various types of debt, equity, and grant funding. It does not include carbon-related revenues, but it could include debt which prefinances such carbon revenues.

ii. Financial Performance Data

Several biomass cookstove manufacturing companies have additional business lines beyond cookstoves, while others sell products in recreational markets as well. Including sales data from these additional lines of businesses would overestimate

cookstove sales. For companies with multiple business lines or in developed markets, only clean cooking-related revenues in developing markets have been included. Reasonable estimates and assumptions such as past year trends or comparable companies were used where data was unavailable.

For companies with sales data missing for certain years, the Alliance conservatively estimated based on earlier volume trends.

For more detailed information, contact:
investment@cleancookingalliance.org

Definitions

Base-of-the-pyramid:⁶ The base-of-the-pyramid (BoP) is a socio-economic concept that allows us to identify a vast segment — in excess of four billion — of the world's poorest citizens as an invisible and unserved market blocked by challenging barriers that prevent them from realizing their human potential for the benefit of themselves, their families, and society at large.

Technically, a member of the BoP is part of the largest but poorest segment of the world's population: those who live on less than USD 2.50 a day and are excluded from the modernity of our globalized societies, which includes consumption and choice as well as access to organized financial services. Some estimates based on the broadest segment of the BoP put its demand as consumers at about USD 5 trillion in Purchasing Power Parity terms, making it a desirable objective for creative and leading visionary businesses throughout the world. One of the undeniable successes in this area is the explosion of the microfinance industry, which has been witnessed in many parts of the world. Off-grid solar companies, often using asset financing/PAYG approaches, have been another more recent success targeting BoP markets. An early-stage market, it has already drawn in billions of dollars of investment and is filling an infrastructure gap

left by governments in Africa, Asia, and other parts of the world.

Commercial Investors: For the purpose of this report, commercial investors include private equity investors, venture capital investors, impact investors, and commercial banks providing equity and debt capital. Apart from financial return, impact investors may focus on impact returns to varying degree. Philanthropic foundations and DFIs who may also invest in debt and equity instruments have been categorized separately.

Endnotes

¹This includes cumulative financing from a range of sources, such as development banks, governments, bilateral development assistance, and the private sector. The investments are projected across a range of technologies, including LPG, biogas, and improved biomass cookstoves. This figure does not include investment in LPG infrastructure. Source: International Energy Agency. <https://www.iea.org/sdg/cooking/>

²Report published by the Clean Cooking Alliance and Accenture, and sponsored by RVO Nederland. cleancookingalliance.org/resources/549.html

³For the purposes of this report, East Africa includes Kenya, Uganda, Rwanda, and Tanzania.

⁴This report excludes such data. The Energizing Finance series from SEforAll takes a somewhat more holistic approach and attempts to track not only direct-to-business financing, but also sector-level funding, though it also faces challenges and significant data gaps, particularly in relation to clean cooking.

⁵As of March 2019, EcoZoom and Biolite have formed a strategic partnership.

⁶Financial Times Lexicon definition.

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The Clean Cooking Alliance works with a global network of partners to build an inclusive industry that makes clean cooking accessible to the three billion people who live each day without it. Established in 2010, the Alliance is driving consumer demand, mobilizing investment to build a pipeline of scalable businesses, and fostering an enabling environment that allows the sector to thrive. Clean cooking transforms lives by improving health, protecting the climate and the environment, empowering women, and helping families save time and money.

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