

## Enabling Market-Driven Technology

*Innovations Case Narrative:*  
Envirofit International

Envirofit International is a social enterprise that combines world-class engineering, product development, and commercial expertise to create products that benefit the health, environment, and economy of some of the world's poorest people by reducing pollution and energy dependency. Established in 2003 as a nonprofit, Envirofit has amassed a dedicated and driven team of strategic thinkers, investment partners, science and technology experts, sales channel partners, and on-the-ground implementers.

Envirofit's original business model focused on commercializing an engine retrofit kit to drastically reduce the noxious emissions of a major cause of pollution in Asia—the ubiquitous motorized three-wheeler taxi. These taxis are powered by a two-stroke engine, and a single vehicle pollutes nearly as much as 50 modern automobiles. The Envirokit™ (a direct in-cylinder—“DI”—retrofit kit) not only reduces these emissions by roughly 80 percent, it also makes the vehicle significantly more fuel efficient. The reduced fuel consumption and costs increase the income of a taxi driver by 50 percent—a significant financial incentive for someone making \$3-\$5 per day.

In 2007, in keeping with its mission, Envirofit added a new business segment focused on reducing pollution inside the home. Half of the world's population cooks with solid fuels, including wood, crop waste, and animal dung. The poor combustion of these fuels creates staggering levels of carbon monoxide and smoke within these people's homes. Envirofit developed a clean cookstove that reduces emissions, improves fuel efficiency, and reduces cooking time significantly—all at a cost of only US\$15-\$30. In just three years, Envirofit has become the global market leader in the design and production of durable, low-emission, high-efficiency cookstoves for wood and charcoal, which are universally acknowledged as the most efficient way to reduce indoor air pollution at scale.<sup>1</sup> It has developed innovative distribution mechanisms in India, Africa, Asia, and Latin America, and works with

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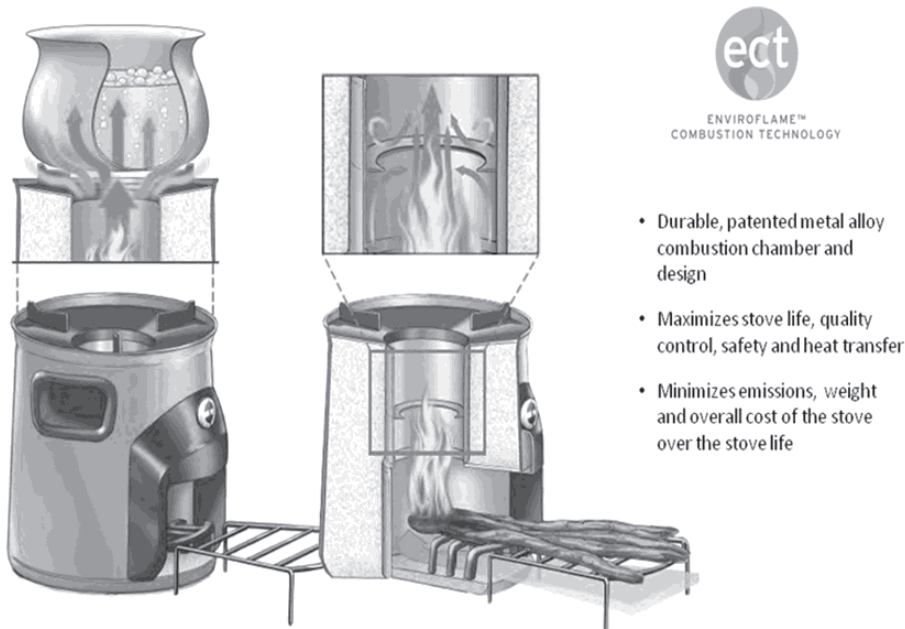


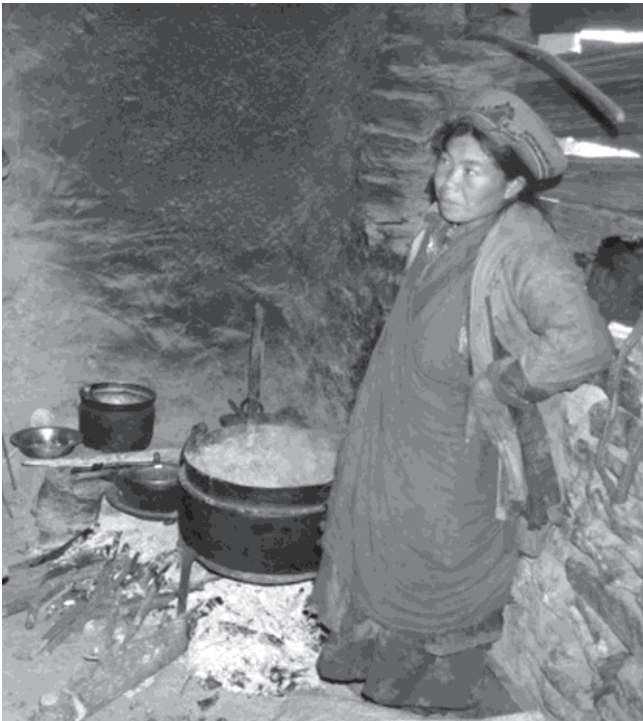
Figure 1. “It is rocket science”—Envirofit cookstove combustion chamber and hot-gas path detail

retailers, NGOs, governments, and microfinance institutions to reach the rural and urban poor.

As of mid-2011, Envirofit has sold over 250,000 of the world’s most efficient stoves in more than 30 countries—a significant number indeed, but miniscule compared to the potential market. Demand continues to grow as the company develops new stoves and combustion technologies, expands its product line beyond cookstoves, creates new financing opportunities through carbon emission reduction markets, and adapts to local requirements on a global scale. Envirofit anticipates that it will sell roughly five million high-efficiency, clean-burning cookstoves over the next five years, which will benefit nearly 25 million people worldwide.

#### ENVIROFIT’S MISSION

Increased indoor and outdoor air pollution is a rapidly growing crisis in much of the world. Emerging research identifies black carbon (soot) from cooking fires and inefficient engines in developing countries as a top contributor to global warming. Second only to carbon dioxide (40 percent), black carbon accounts for 18 percent of greenhouse gas emissions globally. If we could convert 100 percent of the developing world’s approximately 500 million cookstoves to energy-efficient models, it would save 750 million tons of CO<sub>2</sub> annually—more than the UK’s total annual



Effects of vehicle  
pollution: Sunset in  
Manila, Philippines (top)

Typical soot-covered  
kitchen, Nepal (left)

CO<sub>2</sub> output (554 million tons) and equivalent to taking 134 million cars off the road—close to the number of all passenger cars registered in the U.S.<sup>2</sup>

A poor family can spend as much as 50 percent of their annual household income on energy costs, which is a huge economic burden. The fuel they buy is then typically burned in an inefficient, dirty stove that produces harmful emissions.



Household energy (top)

“The Silent Killer”: Indoor air pollution (bottom)

According to the World Health Organization, this type of emissions kills one person every 20 seconds and is a leading cause of death for women and for children under five years old.<sup>3</sup> These problems coalesce into a central issue and are stalemated by a lack of awareness, availability, and affordability, which has forced generations of rural and urban poor into a no-win situation: can a person stop boiling water or cooking food because the smoke pollution is killing them?

Technical solutions, such as clean-engine retrofits or clean-combustion cookstoves, are available to help reduce the health, environmental, and economic effects of problems like indoor air pollution (known as “IAP”). However, worldwide, the IAP problem is too large to be tackled with subsidies or give-away programs, and these technical solutions need to be implemented on a scale large enough to make a global impact. A true market-based solution is needed to reach the hundreds of millions of households currently using traditional cooking methods.

Envirofit’s position is that the primary barrier to the adoption of these products is not a lack of products or affordability—we provide durable, clean, efficient, aesthetic products and offer guaranteed payback mechanisms. The real obstacles are a lack of product access (scale) and product knowledge (awareness). Considering Envirofit’s core competencies in product design, market development, and supply-chain management, creating a cookstove business seemed an attractive opportunity.

#### THE COOKSTOVE MARKET OPPORTUNITY

The global cookstove market is primarily made up of undercapitalized entrepreneurs producing locally manufactured stoves that lack disciplined design, engineering, and test processes. The net effect? Most of these stoves simply don’t reduce indoor air pollution or improve combustion efficiency. They lack aesthetic value and are manufactured without quality control, which results in a poor-quality, nondurable product. Moreover, there are minimal marketing or PR efforts to drive distribution and consumer demand for the stoves, consumer education and government accreditation are essentially non-existent, and consumer financing is limited. As a result of this approach, the inability to scale production/program renders these efforts marginally sustainable at best. Until recently, a typical large-scale program (that is, government or aid agency intervention) would have taken a decade or more to develop and would have been capped at distributing only thousands of stoves per year—a mere drop in the bucket when the global demand for clean cookstoves is estimated at over 500 million.

However, the economic reality for families using biomass fuels to cook their daily meals is that they do not have the means to purchase a stove at current prices. Envirofit’s market-driven distribution model is focused on innovative solutions in product design, marketing, and financing to make it possible for a greater number of people to own one of its cookstoves.

Envirofit designs, manufactures, and sells a line of high-quality, durable, affordable cookstoves (patent pending). Its designs, which have been driven by



## Envirofit's Impact

250,000 stoves sold globally

1.2 million-plus people benefited by the stoves

\$20,551,177 saved by consumers buying fuel

442,707 tons of CO<sub>2</sub> saved (equivalent to removing 110,000 cars from the road)

241,476 tons of wood saved

6,942,445 kilos of carbon monoxide saved

231,214 kilos of particulate matter saved

86,328 kilos of black carbon emissions saved (approximate greenhouse gas equivalent to 200,000 tons of CO<sub>2</sub>)

customer feedback, offer superior aesthetic value. These highly engineered cook-stoves have been tested and proven to reduce toxic emissions by up to 80 percent, reduce fuel consumption by up to 60 percent, and to last for at least five years. In the field, under real-world conditions, reductions in indoor air pollution and the time spent collecting fuel are dramatic. Each stove also reduces carbon output by one to three tons per year, making them excellent prospects for Gold Standard or clean development mechanism (CDM) carbon credit programs. The cost savings resulting from mass production and a global supply chain capable of delivering container lots to remote distributor warehouses allow Envirofit to sell high-quality stoves at the lowest possible cost while maintaining consistent performance and quality.

### KEY INDICATORS OF SUCCESS

Given Envirofit's commercially oriented strategy and tactical approach, success is measured in standard commercial terms using key indicators, including sales volumes, revenues, margins, operating efficiency, and cost per stove. A veteran team of executives and management drives the strategy and execution of business objectives, and quarterly board and business review meetings are held to review strategy and operations. These meetings and efforts also combine stakeholder input—including investment and technology partners—in planning and reviews. For example, the Shell Foundation, which has been a generous funder of Envirofit since 2007, has a seat on Envirofit's board, and several of its representatives attend the business review meetings. While a focus on key business metrics drives the company's sustainability, Envirofit is also very proud of its nonfinancial performance. It tracks other key metrics, such as households and people helped by its product in terms of lower fuel costs and reduced air pollution.

FUNDING ENVIROFIT

Envirofit had substantial product- and market-development costs for both the engine retrofit and cookstove business models. Significant R&D and business development costs were required up front, before having any product sales. It was projected that financial returns would be realized at a slow, gradual pace through a low-margin, high-volume business model common to socially oriented products in emerging markets. In 2003-2004, these terms were not overly attractive to conventional investment sources. Social capital investment, or venture philanthropy, was only beginning to emerge at the time of Envirofit's initial fundraising efforts; the term "impact investing" had yet to be coined. Due to the low financial returns and the fact that Envirofit's business was being built around a strong social and environmental mission, the founders decided to choose a nonprofit form, and the company received its 501(c)(3) status in 2004.

The cofounders initially conducted fundraising through their network, based on their track record and combined with a legacy of successful enterprises being launched from Colorado State University laboratories. Nonetheless, their networks were invested in more traditional start-ups, and none of the cofounders had significant experience seeking grant funding from foundations, so it took almost a year to find sufficient capital. Operations started in November 2004, when an initial grant of several hundred thousand dollars was eventually secured from the Bohemian Foundation, which is also based in Fort Collins, home of Colorado State. Bohemian had a generous tradition of supporting unique local initiatives and opportunities, as well as the university. While the initial grant was focused on proof-of-concept piloting for the retrofit business, the Bohemian Foundation gave Envirofit consistent, multiyear backing in order to prove out the business model and market. The foundation also had board representation and provided significant assistance on a number of issues as the business and its team matured.

Eventually, as successes materialized, the funding strategy evolved. The focus was on three potential funding streams that overlapped with Envirofit's core mis-

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sion: (1) technology development and transfer; (2) energy reduction and environmental preservation; and (3) pollution reduction and end-user health benefits. Leveraging the ongoing investment commitment from the Bohemian Foundation, Envirofit was able to approach other groups. The Lemelson Foundation was identified as having a funding profile synergistic with Envirofit's mission, and it committed to a full funding cycle during a period of critical technology expansion and growth for Envirofit. Other opportunities arose with a snowball effect, and Envirofit continued to broaden its reach by developing additional products and markets. The company supported a DI retrofit kit technology demonstration effort in India that was led by the U.S. Environmental Protection Agency. During this time, Envirofit's work was also validated by the company's earning several honors, including being named a Tech Awards laureate and a winning a World Clean Energy Award.

Building a reputation—as well as a business and a market—takes time. As Envirofit gained greater exposure through increased press, recognition, and awards, it also gained the credibility and confidence needed to attract larger investors. Pursuing multiple and distinct funding tracks also created an opportunity to evaluate complimentary business models; entering the world of indoor air pollution and improved cookstoves was one example. The Shell Foundation had launched its Breathing Spaces program in 2003, which was aimed at tackling indoor air pollution by identifying and developing market-oriented and commercially viable solutions. Envirofit's credibility and reputation, earned in part by receiving the Bohemian Foundation's support as lead investor and the Lemelson Foundation's support at a critical juncture, were leveraged to engage the Shell Foundation in developing a relationship as commercial partners in an effort to deploy millions of improved cookstoves through an enterprise-based approach. Shell took the lead investor role with an initial \$3.5 million investment designed to enable Envirofit to raise the total \$25 million investment required to grow and scale a global cookstove business.

Now, in 2011, Envirofit is in the process of spinning off a for-profit enterprise and capitalizing on its position as the world's leading cookstove designer and supplier. Building on continued support from the Shell Foundation, Envirofit is seeking to attract the commercial capital required to achieve larger scale and impact. A key to finding this funding is the company's demonstrated commercial track record, its history of including key stakeholders in strategy and planning, and its transparency in sharing results and lessons learned with its partners.

## MISSION TO SCALE

One of the key developments during the progression of Envirofit's growth has been the maturation of the clean development mechanism process and carbon credit market.<sup>4</sup> The monetization of carbon credits been realized for cookstove programs only in the last few years, which has led to a recalibration of Envirofit's business model. The advent of carbon credits has allowed Envirofit to target a



broader range of markets that may not have been viable without carbon finance. Envirofit has strategically embedded a number of key carbon asset features into its operational approach, thereby developing the ability to finance a subsidy on a product and lower its cost to the retailers, distributors, and nongovernmental organizations, which enables it to sell the product at a subsidized price that is affordable for most end users. This requires maintaining a delicate balance throughout the supply chain to ensure attractive channel margins for the network. This approach is in fact primarily what CDM credits were designed to do—subsidize the cost of technology so that it is affordable to people who would not have been able to use it without this cost reduction—but it has been accomplished infrequently. The net result of this carbon credit approach is that end users can purchase an Envirofit stove for not much more than a traditional stove.

The margin stream in Envirofit's original business model was lean, but it did project profitability and steady growth. The carbon revenue expands the company's market potential, accelerates the growth curve, and eases access to capital—all of which are critical to scaling the business. The carbon strategy currently being used will increase sales volume in the next five years by 300 percent over the original plan. And, true to mission, the more improved stoves in the field, the greater the impact on health and environment.

#### KEY LESSONS LEARNED

The past eight years have provided valuable experience on a number of fronts. The path from start-up to having hundreds of thousands of customers has not always been easy or obvious. Below are a few ideas on accessing capital for other entrepreneurs who are building businesses that plan to sell products to customers earning \$2-\$5 per day:

- Be relentless in every facet of your business. Employ the right team, and get knowledgeable about customers, technology, supply chains, environmental health, and accounting. All of these are not only critical for success, they also help investors get comfortable and to trust that you will put their capital to work responsibly.
- Make sure that you check out your funding sources as much as they do you. As scarce as capital can be, it is important that your funders are aligned with your goals, expectations, and returns, both financial and social. Dive deeper than just asking, "Are you impact first or financial first investors?" Envirofit has walked away from potential funding because the funder's goals and/or philosophy did not align with its own.
- Be creative in your pitch. Some groups that may not be willing to fund your business as a whole may be interested in supporting a part of it—social marketing, low-cost inventory finance, specific country carbon programs, etc. By focusing your "ask" you can make the overall "nut" smaller and reduce your core business cash needs significantly.

- Be consumer driven. Know your customers, take their pulse, and make sure that every product or service that goes to market has their input and—as our CEO says—“Don’t forget who writes our paychecks.”
- Be open-minded—about your product, your technology, your partners, and your business model itself. The process of building a business involves constant change and adaptation while keeping a focus on your core values. There are lots of ways to do things, and sometimes it takes time to figure out the best ways.

Envirofit continues to focus on making an impact. We strongly believe that a market-driven approach is a necessary backbone to helping solve the problems we focus on—at any level of scale. The company’s vision is larger than the number of lives saved or tons of emissions reduced by implementing a particular technology. With innovative products, services, and financial mechanisms, we are creating a new global standard for cookstoves, thereby addressing problems and challenges that affect half of the world’s population. At a very basic level, the efforts and results of Envirofit have always been and will continue to be made possible by impact investment.

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1. The Global Alliance for Clean Cookstoves. Available at <http://cleancookstoves.org/overview/solution/>.
  2. Shell Foundation, Breathing Spaces fact sheet. Available at [http://www.shellfoundation.org/pages/core\\_lines.php?p=corelines\\_inside\\_content&page=breathing&newsID=69](http://www.shellfoundation.org/pages/core_lines.php?p=corelines_inside_content&page=breathing&newsID=69).
  3. World Health Organization, “Fuel for Life Report, 2006.” Available at <http://www.who.int/indoorair/publications/fuelforlife/en/>; World Health Organization, Media Centre fact sheet. Available at <http://www.who.int/mediacentre/factsheets/fs292/en/>.
  4. The Clean Development Mechanism is one of the “flexibility” mechanisms defined in the Kyoto Protocol (IPCC, 2007).