

Reaching the Last Mile

*Innovative Business Models
for Inclusive Development*

Editors Elaine Tinsley and Natalia Agapitova



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*Social Enterprise Business Models
for Inclusive Development*

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Foreword

Johannes Linn

Bringing essential services to the poor, whether in remote rural areas, provincial towns, or in the slums of megacities, is a great challenge for governments in developing countries. Lack of governmental capacity and fiscal resources at the national and local levels prevents effective public provision of water, power, education, and health services to the poor. And private firms, which often step in to serve the middle and upper classes, are dissuaded by high risks and low affordability from providing these services to the poor, or what is sometimes referred to as “the last mile.”

In contrast, social enterprises have been able to provide basic goods and services to the poor. The distinctive feature of social enterprises is that social impact is their *raison d’être*, rather than maximizing profit. This allows them to test innovative solutions and experiment with new techniques and approaches, while responding to the needs of the communities in which they are imbedded and treating them as empowered customers rather than beneficiaries of public or private largesse. The engagement of social enterprises provides important lessons on how to reach the poor—how to make them aware of problems and solutions, designing products that address their needs, and making these products available and affordable.

While specific examples of successful social entrepreneurship in social service provision have been written, no systematic assessment of their engagement has been available until now. This is the gap that the present book aims to fill. It catalogues over 40 of the most effective market-based solutions for service delivery to the poor brought about by social enterprises. It tracks how stylized business models have been developed to address development challenges. The sectors covered are education, energy, health, waste, water, sanitation, and finance. The book’s analysis employs and greatly benefits from systematically applying a common framework that helps explain the relevance and implementation of the model for even general development practitioners.

While the case studies are an essential ingredient to understanding the role social enterprises play in service delivery to the last mile, the book also adds a valuable cross-cutting perspective with lessons for how to frame strategies to reach the poor, such as enhancing consumer awareness, assuring effective distribution, improving affordability, and using ICT. And, perhaps most importantly, the volume closes with a section on how to scale up the impact of social enterprises in service provision to the last mile, including effectively measuring results, pursuing replication with adaptation, and ensuring a supportive role of government and public policy. Indeed, the book concludes that scaling innovation solutions for reaching the last mile depends on mutual trust and effective collaboration between social enterprises and the government.

Anyone interested in market-based solutions that serve the interests of the poor will find this book of great relevance to their work, whether they are social entrepreneurs and their funders and supporters, development practitioners, or governmental policy makers and administrators. The rich evidence and sound analysis they find here will help them grasp the opportunities and meet the challenges they face in reaching the poor with essential social services—and thus successfully traversing “the last mile.”

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Our gratitude also goes to the many social enterprises featured who offered insights into their operations, challenges, and successes, and for their untiring efforts to make the world a better place.

Introduction

In much of the developing world, governments struggle to provide crucial services to populations, especially those living in extreme poverty in remote or underserved areas. The private sector can be looked upon to help close this gap, but there are high risks within this market that can dissuade businesses' engagement.

The continuing lack of access to healthcare, high-quality education, clean drinking water, working sanitation services, and reliable energy sources are preventing the poorest populations from escaping the poverty cycle. To fill this service delivery gap for underserved poor and hard-to-reach populations, social enterprises are implementing innovative solutions in various sectors.

Social enterprises use market-driven methods to advance their social mission to serve the “the last mile.” Because of their strong presence and understanding of the local communities they serve, they often develop a business model that is faster and more cost-effective in providing basic, quality services and products. More importantly, the poor are their clients, not just beneficiaries. Products and services must resonate with the clients, provide value for money, and be accessible to them—by addressing these key points, social enterprises can develop a market that encourages uptake of these goods and services for the betterment of individuals and communities.

Across the globe, social enterprises have been growing and there is much to learn from their experiences in reaching the poor. Rather than focusing on individual case studies of successful social enterprises, this book focuses on the similar solutions and business models they have developed to address critical development challenges.

This book is based on the experience of more than 300 social enterprises, catalogued into more than 40 business models that have developed market-based solutions for service delivery to the poor in several sectors: education, energy, health, waste, water, and sanitation. The models include low-cost chain schools to provide highly standardized education for low-income children; mini-grids to connect remote communities that lack access to the existing electric grid; telemedicine to diagnose and treat patients in underserved areas;

community-level waste collection to reduce the burden on strained public sector operations; and serviced toilets to improve sanitation for urban slums.

Each profiled model is derived from the stylized experiences of several social enterprises that were selected based on their proven impacts. Information was extracted from interviews with the social enterprises and sector experts, background research, and third-party impact analysis where available. The models employ a systematically applied common framework consisting of the following interlocking elements:

1. Analysis of the development challenge.
2. Exploration of the business model (components, costs, revenue, financial viability, partnerships).
3. Focus on implementation that delivers value to the poor (“Four As”: awareness, acceptance, accessibility, and affordability).
4. Tracking results and cost-effectiveness (scale and reach, improving outcomes).
5. Scaling up (challenges, the role of government and public policy).

Together these elements provide a basic understanding of the model’s functionalities and the potential challenges and benefits to adoption. The purpose of this work is to introduce the development community to the range of solutions being implemented, rather than give detailed implementation guidelines on a particular model.

To reach the last mile, we also found that enterprises use similar strategies across different models. In the latter portion of the book we draw out some of these cross-cutting strategies that can inform other enterprises, NGOs, donors, and governments on improving their implementation efforts to the base of the pyramid. The topics covered include raising awareness, distribution, affordability, and information and communications technology. Scaling for impact discusses the role of government to support social enterprises as a partner in development.

The audience for this book is those interested in market-based solutions that serve the interests of the poor and participating in the dialogue around the social enterprise agenda—development practitioners, social entrepreneur enablers, and policy makers. Organizations can find relevant enterprises and models that inform their development operations. A separate volume on social enterprises in the agriculture sector is also available, *Private Sector Solutions to Helping Smallholders Succeed: Social Enterprise Business Models in the Agriculture Sector*. At the heart of these solutions is treating the poor with respect, expanding access in low-income markets, and promoting inclusive job opportunities.

While these cases illustrate the difficulties of reaching and serving the last mile, their demonstrated results and opportunities for scaling up show immense potential. Making such improvements and scaling up will depend on collaboration with the government and other partners, who can strengthen social enterprise activities and thus generate better economic, social, and environmental results for the poor.

Abbreviations and Acronyms

AC	Alternating Current
AEC	Ahmedabad Electric Company
ASHA	Accredited Social Health Activist
ATM	Automatic Teller Machine
B2B	Business-to-Business
B2C	Business-to-Consumer
BMI	Business Model Innovation
BoP	Bottom of the Pyramid
BOT	Build-Operate-Transfer
BPO	Business Process Outsourcing
CBO	Community-Based Organization
CDC	Centers for Disease Control and Prevention
CDI	Centers for Digital Inclusion
CER	Certified Emission Reduction
CHW	Community Health Workers
CLTS	Community-Led Total Sanitation
CMC	Community Management Committee
CNE	Community Nutrition Educators
CO2	Carbon Dioxide
CPCB	Central Pollution Control Board
CSC	Common Services Center
CSR	Corporate Social Responsibility
DC	Direct Current
DDD	Digital Divide Data
DFID	U.K. Department for International Development
ECG	Electrocardiogram
EDM	Electricidade de Moçambique

EMRI	Emergency Management and Research Institute
EMT	Emergency Medical Technician
EPA	Environmental Protection Agency
EPR	Extended Producer Responsibility
FAO	Food and Agriculture Organization
FLO	Fresh Life Operator
FMCG	Fast-Moving Consumer Goods
GAIN	Global Alliance for Improved Nutrition
GHG	Green House Gas
GMI	Gray Matters India
HLFPPT	Hindustan Latex Family Planning Trust
HLC	Hippocampus Learning Centres
HP	Horse Power
HUL	Hindustan Unilever Ltd
ICT	Information and Communications Technology
IDA	International Development Association
IGS	Indian Green Services
ISRO	Indian Space Research Organization
ISSP	Impact Sourcing Service Provider
ITA	Idara-e-Taleem-o-Agahi
JI	Jayaashree Industries
LAICO	Lions Aravind Institute of Community Ophthalmology
LCDI	Link Community Development International
LVPEI	LV Prasad Eye Institute
MFI	Micro-Finance Institution
MNC	Multinational Corporation
MNES	Ministry of Nonconventional Energy Sources
MSI	Marie Stopes International
MSW	Municipal Solid Waste
MT	Metric Ton
NABARD	National Bank for Agriculture and Rural Development
NEMA	National Environment Management Authority
NGO	Non-Governmental Organization
NORAD	Norwegian Agency for Development Cooperation
NUSP	National Urban Sanitation Policy
NWP	National Water Policy
OBCSDP	Opportune Breast Cancer Screening and Diagnosis Program
OOP	Out-of-Pocket
OREDA	Orissa Renewable Energy Development Agency
OTC	Over-the-Counter
PET	Polyethylene Terephthalate
PMC	Pune Municipal Corporation
PPE	Personal Protective Equipment
PPI	Progress out of Poverty Index
PPP	Public-Private Partnership

PSI	Population Services International
QIP	Quality Improvement Program
R&D	Research and Development
RCT	Randomized Control Trial
RIEB	Ramayamma International Eye Bank
RoI	Return on Investment
RTE	Right to Education Act
SACCO	Saving and Credit Cooperative
SAFE	South Asian Forum for Environment
SASI	School Assessment for School Improvement
SBT	Soil Biotechnology
SHS	Solar Home System
SREP	Scaling-Up Renewable Energy Programing Low Income Countries
STIR	Schools and Teacher Innovating for Results
SuSanA	Sustainable Sanitation Alliance
SWaCH	Solid Waste Collection Handling
SWM	Solid Waste Management
SWOT	Strength-Weakness-Opportunities-Threats
T4T	Technology for Tomorrow
TB	Tuberculosis
TTF	The Teacher Foundation
UNEP	United Nations Environmental Program
UNHCR	United Nations High Commissioner for Refugees
VAT	Value Added Tax
VLE	Village Level Entrepreneur
WASH	Water and Sanitation
WHO	World Health Organization
WSIP	Whole School Improvement Plan
WSUP	Water and Sanitation for the Urban Poor
WUA	Water Users Association
WW!	Wetlands Work!
ZD	Zero Discharge
ZLD	Zero Liquid Discharge
ZWM	Zero Waste Management

SECTORAL BUSINESS MODELS

EDUCATION

A B C D E
J K L M N
R S T U V W



Providing Low-Cost Private Schooling to the Poor

Private schools are leveraging scale, standardization, and brand to provide affordable, good-quality, basic education for the poor

HIGHLIGHTS

- The school-in-a-box model involves highly standardized, scalable, branded schooling in which the chain designs and implements all educational inputs and business processes.
- Chains recruit para-skilled teachers from local communities, whom they train to deliver lessons of near uniform quality.
- Student and school performance is monitored and evaluated, enabling data-driven quality control, and research and development to improve outcomes.



Summary

Low-cost chain schools charge low or nominal fees to provide highly standardized education to large numbers of children in low-income communities. The companies are typically vertically integrated organizations that build and operate schools. Several have adopted a “school-in-a-box” model, designed to radically constrain costs and maintain consistent service quality, in order to build a trusted school brand.

Development Challenge

Providing their children with good-quality basic education is a struggle for parents at the bottom of the pyramid (BoP). As a result, an estimated 40 percent of the world’s primary school-age children—a quarter of a billion children—lack basic numeracy and literacy skills,

even though more than half of them have completed four years of primary school (UNESCO 2015). In the poorest quintile, a third of 14- to 16-year-olds fail to complete primary school (UN 2015). The high cost of education, lack of access, shortages of resources, teacher absenteeism, and overcrowded schools are key barriers to learning.

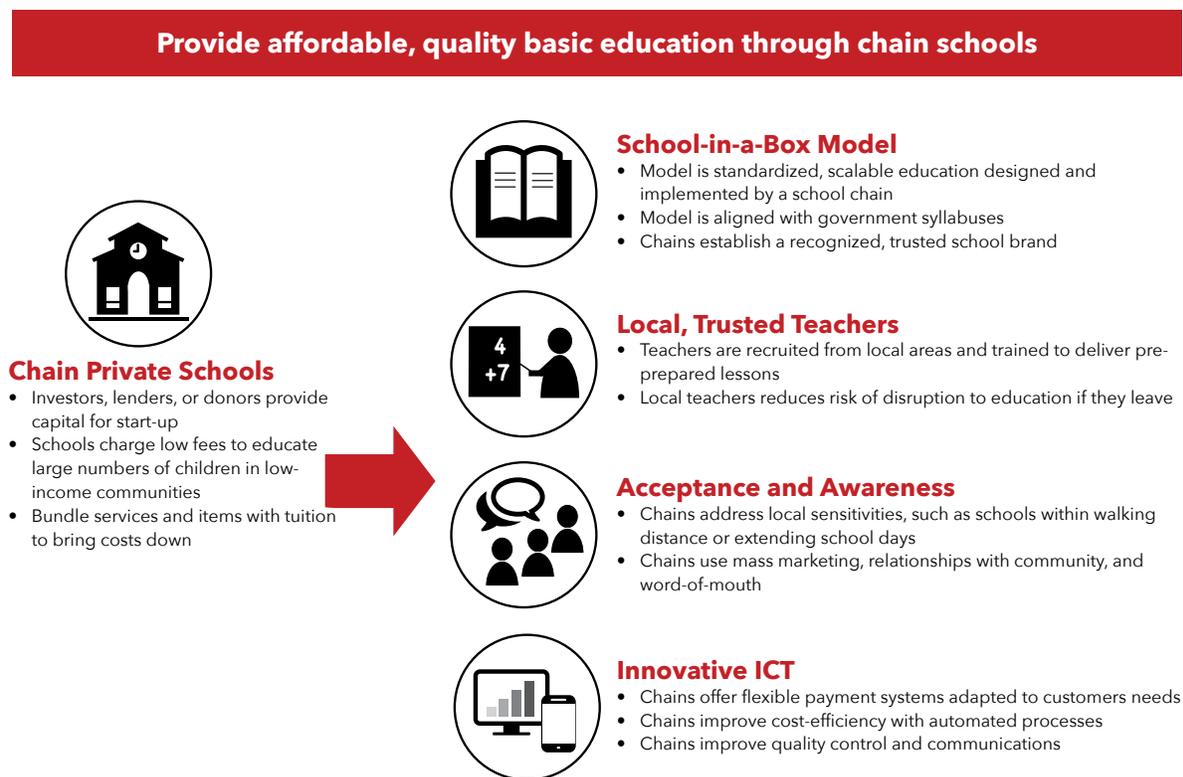
Business Model

Components of the Model

Low-cost chain schools address rising demand from low-income families for affordable, good-quality schools located in their communities. Some provide primary schooling only, others specialize in secondary schooling, and a few offer both. Investors, lenders, donors, and development agencies provide the capital to design the business model and educational inputs.

Chain schools' key innovation is the vertically integrated "school-in-a-box" business model, which leverages economies of scale, centralized purchasing, and standardization to minimize costs and school fees and enable expansion at low marginal cost (see figure 1). Chain schools typically design and deliver all inputs, from school buildings and business processes to curriculum development, teacher training, and lesson plans. Senior management

Figure 1. Features of the low-cost chain schools model



handles most major budget lines on behalf of individual schools, including procurement, recruitment, and payroll. It enforces consistent delivery of school services and quality control, in order to establish a recognized, trusted school brand. Low-income parents choosing schools generally lack access to reliable measures of school quality. A trusted brand bridges that information gap, acting as a proxy for quality. First movers pioneering this model are Bridge International Academies in Kenya and Omega Schools in Ghana.

Two key elements of the model are the use of para-skilled teachers and innovative applications of information and communication technology (ICT). Chain schools frequently train local people who are not qualified teachers to deliver standardized lessons using materials and methods created by the chain. They use ICT to automate processes such as registration, payroll, and fee collection. Both Bridge and Omega operate cashless fee payment system. Bridge parents pay their fees using the M-Pesa mobile phone payments system; Omega parents use a daily voucher system. Several chains have developed proprietary school management software solutions that enable continuous data exchange between individual schools and central management. Bridge uses mass text messaging for this purpose. Vienova uses ICT to deliver some classes remotely. SPARK Schools is implementing one of Africa's first blended learning models, combining teacher-led instruction and computer-based learning.

Cost Factors

A new Omega school costs about USD 75,000, a new Bridge school about USD 60,000, according to the companies. As of 2013, Bridge's cumulative investments were about USD 40 million. Equity investors, lenders, private donors, and development agencies provide financing. Attracting large-scale investment can be challenging, because many impact investors remain cautious about building schools for BoP customers.

Revenue Streams

School chains charge fees from parents to enable individual schools to reach operational sustainability once they enrol a critical mass of students. Using technology and data, chain schools drive enormous efficiencies both in terms of the overhead costs required to run an academy and in terms of increasing the quality of the output. Older schools can cross-subsidize newer ones, another advantage over stand-alone private schools. Any surplus income is used for training and R&D.

Schools typically charge parents school fees. Most chains are for-profit enterprises (Bridge International Academies, Omega Schools, Vienova). Some are donor-supported non-profit institutions (BRAC Shishu Niketan Schools, The Citizens Foundation, LEAP Science & Maths Schools).

Financial Viability

Sustainability at for-profit chains depends on reducing costs and attracting large numbers of fee-paying students. Bridge expects its schools to break even after one year and to repay set-up costs within four years. Omega reports that its schools are self-sustaining when enrollment reaches 300 students. Some schools can typically fill to capacity within two weeks of opening. SPARK projects earning profits of USD 144,000 per school when the school is filled to capacity.

Nonprofit chains rely on substantial support from donors. At The Citizens Foundation, tuition covers just 5 percent of schooling costs; donors fund the rest. LEAP charges no fees; donors cover 85 percent of annual costs, with subsidies from provincial governments covering the remaining 15 percent. LEAP's accumulated deficit of about USD 550,000 led it to reduce student intake and increase teacher workloads. Both LEAP and The Citizens Foundation have sought to enhance their sustainability by establishing endowment funds, which will eventually contribute to operating costs.

Partnerships

Donors and investors provide grants, loans, and equity financing to chain schools, primarily to cover capital expenditure and start-up costs. Investment by Omidyar Networks allowed Bridge to build its management team, construct new schools, and cover overhead expenses. A leading investor is the Pearson Affordable Learning Fund, which has stakes in APEC, Bridge, Omega, and SPARK Schools.

Implementation: Delivering Value to the Poor

Awareness

Awareness mainly takes the form of marketing the school. Approaches range from conventional mass marketing to word-of-mouth advocacy. Bridge advertises on billboards, over the radio, and via text messaging. Omega relies on word-of-mouth and door-to-door canvassing; it also sends school managers into the community to recruit students and staff. Vienova posts ads on walls, distributes leaflets, has teachers go door to door, and sponsors community events. BRAC leverages its networks to advocate for its schools and employs experienced teachers who are trusted by the target community. LEAP cultivates long-term relationships with community organizations and primary schools that feed students into its secondary schools.

Acceptance

Chain schools meet demand for alternatives to inadequate public schooling by developing distinctive school systems and educational methods. They construct schools with up-to-date facilities and ICT systems and address local concerns and sensitivities. The Citizens Foundation employs only female teachers and principals, in order to encourage conservative Pakistani families to send their daughters to school. LEAP builds community work into its curriculum, assisting social development organizations and providing after-school lessons to public school students. It reserves all places for disadvantaged children.

Chain schools provide economic opportunities by recruiting local teachers, school managers, ancillary staff, and construction workers. Recruiting teachers from the community improves accountability and promotes more engaged teachers who are also more socially connected to their students.

Accessibility

Schools are within walking distance of target communities, minimizing the risks and costs of travelling to and from school. Bridge conducts household surveys to gauge a community's suitability based on population density and income. Omega identifies areas with large numbers of children and other private schools (indicates receptivity to paying fees). Extended school days and extracurricular activities maximize the availability of core teaching services and teacher-student contact time. To reduce teacher absenteeism and inactivity, chain schools use centralized management to monitor their attendance and performance.

Affordability

Schools bundle services and items such as uniforms, examination fees, and textbooks with tuition fees, in an effort to reduce costs to levels comparable to or below public and stand-alone private schools. BRAC's package includes transport. Omega's all-inclusive daily fee includes midday meals, uniforms, and school bags.

Chain schools (see table 1) also offer flexible, convenient fee payment systems that accommodate the irregular cash flows of many parents and are easy to understand. Examples include Bridge's mobile payments system, Omega's daily fee vouchers (branded "pay-as-you-learn"), and The Citizens Foundation's sliding scale of fees, which is based on household income. Omega allows parents several fee-free school days each term. Vienova reserves 20 percent of revenues for scholarships for needy students.

Table 1. Fees charged by low-cost chain schools

<i>Chain school/ country</i>	<i>Education level</i>	<i>Cost</i>	<i>Coverage</i>	<i>Fee system</i>
BRAC Shishu Niketan Schools (Bangladesh)	Primary	Average fee is USD 2.55 a month, USD 4.50 for higher grades. Cost is higher than public schools but about one-third the cost of private kindergartens offering similar services (Nahid and Nath 2014).	Tuition, admission fees, books, uniform, bag, examinations, and transport	BRAC program organizers and teachers collect fees from parents
Bridge International Academies (Kenya, Uganda)	Pre-primary and primary	Average tuition fees are USD 6 a month; exams and workbooks cost another USD 2 per term. According to Bridge, government schools cost USD 2-12 a month, and its services are 70 percent less expensive than other low-cost private schools.	Tuition, textbooks and other instructional materials, and extra reading books. Uniforms and meals are not included; they are sold separately by Bridge.	Parents pay using M-Pesa mobile payments, with payment tracked by text message.
The Citizens Foundation (Pakistan)	Primary and secondary	A nominal fee of USD 0.10–USD 2.5 a month is charged, depending on family circumstances.	Tuition, admission fees, books, uniform	Donors fund TCF and they charge a nominal fee from parents and offer scholarships to students from low-income families.
LEAP Science & Maths Schools (South Africa)	Secondary	Schooling is free; a nominal fee is charged for community activities. LEAP estimates that its costs of about USD 3,150 per child per year are twice what the South African government spends per child.	Tuition, breakfast, lunch, textbooks, and stationery. Uniforms are heavily subsidized. Transport is not included.	Private donors fund 85 percent of costs, provincial government subsidies cover about 15 percent. Parents pay for transport.
Omega Schools (Ghana)	Primary and lower-secondary	Fees are about USD 0.57 a day (USD 120 per year). Equivalent to government school costs when additional items (uniforms, stationery, and examination fees) are included, according to Omega, which reports costing less than 13 of 16 neighboring private schools in 2014.	Tuition, hot meal, two uniforms, school bags, and workbooks	Third-party sell Omega vouchers, which students present to schools. School managers return the vouchers to head office to be resold to vendors.

Table 1. Fees charged by low-cost chain schools (continued)

<i>Chain school/ country</i>	<i>Education level</i>	<i>Cost</i>	<i>Coverage</i>	<i>Fee system</i>
Vienova Schools (India)	Pre-primary, primary, and secondary	Fees are USD 10 a month. Scholarships are provided for needy children (20 percent of revenues are set aside to fund them).	Tuition, co-curricular activities	Schools collect fees from parents.

Results and Cost-Effectiveness

Scale and Reach

Both for-profit and nonprofit chains have scaled impressively, reaching significant numbers of students quickly and attracting new investment. Omega expanded from 2 schools in 2009 to 38 schools serving more than 20,000 children in 2013. Just six years after launching, Bridge was educating more than 108,000 children at more than 400 schools in Kenya, most of them in very poor areas. In 2014, The Citizens Foundation provided low-cost education to 145,000 children at 1,000 schools across 100 locations.

Improving Outcomes

Both independent and self-reported evidence indicates that chain school students are outperforming their peers. The Citizens Foundation and LEAP and have achieved very low dropout rates, and their students have outperformed others on national examinations. Both have high-school graduation rates of more than 90 percent, and a significant percentage of their graduates pursue higher education. Just 1 percent of The Citizens Foundation's students failed to graduate, an extraordinary figure in a country (Pakistan) where the average figure is 45 percent. LEAP's dropout rate is below 6 percent—a fraction of the 49 percent average in South Africa.

Test performance of low-cost schools has been spectacular, according to the companies and third-party evaluations. In 2015, the first cohort of Bridge students sat for the national primary education certificate exam. Their mean score of 264 was significantly above the public school mean of 180—and even exceeded the private school mean of 230. According to LEAP, between 2008 and 2013, 91 percent of its students passed the national math examination, and 85 percent passed the science exam (the national pass rates were 50 percent for math and 52 percent for science). Omega students outperformed their peers in public schools by 15–21 percent on English tests and about 10 percent on grade 3 math tests, performing about as well as private school students. SPARK reports that its first class of students gained a year and a half in reading and math ability during 2013 and performed a year ahead of their peers at other schools.

Cost-Effectiveness

Some data suggests that chain schools are providing value for money in comparison to government and other private schools. In 2012 Omega's annual fees in Ghana amounted to just USD 113 per student—significantly less than the recurrent unit cost per student in public primary schools of USD 166 (Ghana Ministry of Education 2013). According to Spark Schools, in 2013 it charged about USD 100 less a year than the South African government spent on equivalent students. In contrast, LEAP's annual per student costs of USD 3,150 are about twice what the government spends. According to a 2014 report, BRAC's Shishu Niketan schools charged one-third as much as equivalent private kindergartens but more than equivalent public schools (Nahid and Nath 2014).

Scaling Up

Challenges

Nonpayment is a major challenge for some schools. Like many low-cost private schools, Omega has allowed parents some flexibility on fee payments. It writes off some fee arrears, making operational sustainability a challenge.

Despite chain schools' efforts to create trusted brands and quality services, parents often struggle to distinguish between competing private schools. Independent school ratings systems based on actual learning outcomes could benefit both parents and chain schools concerned with raising standards.

Role of Government and Public Policy

Abolishing school fees without increasing investments led to overcrowding and lower-quality education in many countries, creating strong demand for low-cost private schools. Private sector involvement in education at the BoP is controversial in some countries, however, as reflected in regulatory and policy disincentives to develop or invest in low-cost chain schools.

- *Regulation*

Strict regulatory requirements focused on school infrastructure and inputs rather than learning outcomes may hinder the development and viability of low-cost chain schools. Teachers at low-cost schools with little as eight weeks training often achieve better educational outcomes than public school teachers with two years of training; requiring such training may therefore be counterproductive. Requirements that schools have a minimum plot size can make it difficult for low-cost schools to operate in congested slum areas. Focusing on these inputs rather than outcomes makes it difficult or impossible for low-cost private schools to operate.

India’s Right to Education Act requires private schools to allocate 25 percent of their seats to children from poor families for free. The government reimburses the schools for the fees of these students, who are selected by lottery. This measure has been difficult to implement, partly because the poor administrative capacity of many states complicates the already cumbersome task of identifying which students qualify for assistance.

- *Government subsidies*
LEAP is the only chain school that directly benefits from government subsidies. It receives only half the subsidy it would receive if it were a public school, however. Moreover, it loses its subsidy if it charges any fees. LEAP is lobbying to receive 100 percent of the subsidy. Other models of government support could include voucher schemes or cash transfers to families to cover schooling costs.
- *Contract schooling*
Contract schooling—in which private enterprises manage government-funded schools—is an established public-private partnership model in Latin America. LEAP is advocating for such an arrangement, which could enable it to enhance school quality and expand education to marginalized communities where public provision is lacking and stand-alone private schools might struggle to be viable. Because of their scale, chain schools can spread financial risks and operational risks across their operations, making them promising candidates for expanding schooling in challenging environments.

Table 2. Social enterprises: Low-cost chain schools

<i>Company</i>	<i>Country</i>	<i>Description</i>
Affordable Private Learning Centers (APEC)	Philippines	Offers secondary education for about USD 500–USD 540 a year, with focus on employability, life skills, and English. Promises that graduates will move into higher education or professional employment.
BRAC Shishu Niketan Schools	Bangladesh	Provides “one room, one teacher” schools in which one teacher delivers lessons in all subjects to a cohort of primary school children for five years. Schools are located in rented premises in low-income rural communities. Goal is for each school to become self-sustaining.
Bridge International Academies	Kenya, Uganda	Offers nursery and primary education in purpose-built schools staffed by para-skilled teachers trained to deliver scripted lessons using handheld tablets. Model standardizes all inputs and processes. It is centrally managed to enable rapid scale-up at low cost.
The Citizens Foundation	Pakistan	Provides affordable primary and secondary private education to students in urban slums and rural areas, with a focus on girls. All principals and teachers are women. Fees are based on sliding scale.
Innova Schools	Peru	Offers student-centered schooling in purpose-built facilities using blended learning techniques that combine computer-based individual and group learning. Partnered with IDEO (a global design company) to design all aspects of the school. Online teacher resource center supports staff with lesson plans and other resources. Schools target middle-income families, charging about USD 110 a month.

Table 2. Social enterprises: Low-cost chain schools (continued)

<i>Company</i>	<i>Country</i>	<i>Description</i>
LEAP Science & Maths Schools	South Africa	Provides free secondary schooling in relatively small classes to underprivileged students with large learning deficits. All students study math, science, and English; receive self-awareness training; and perform community service. LEAP partners with community groups and privileged private schools to foster social integration and share resources and expertise.
Omega Schools	Ghana	Offers low-fee primary and junior high school education. School-in-a-box model is based on scale and standardization; para-skilled teachers; and a centralized, ICT-enabled management and monitoring system.
SPARK Schools	South Africa	Provides low-fee primary schooling using blended learning model that combines teacher-led instruction and computer-based instruction to reduce teaching commitments, costs, and fees, which are roughly equivalent to public school costs. Centralized management of business and academic functions also realizes savings.
Sudiksha Knowledge Solutions	India	Offers affordable preprimary schooling (USD 8 a month) in 22 schools in underserved areas in and around Hyderabad. At least half of schools, local women with entrepreneurial skills are trained to operate the schools as franchises, in return for 10 percent share of school's profits. Develops own curriculum, using methods from Montessori and Waldorf schools.
Vienova Schools	India	Operates preprimary, primary, and secondary schools in semi-urban areas of northern India. Leverages ICT to create standardized, technology-led system of instruction and school management. Offers some classes via Skype, delivered by highly qualified teachers.

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Challenge

Even after completing primary school, up to a quarter of South African children remain illiterate and innumerate (Spaull and Taylor 2012). Among disadvantaged children who do complete basic education, few qualify for tertiary education or succeed at math and science since high school “graduates” are inadequately equipped with emotional intelligence, self-awareness and life skills.

Innovation

LEAP Science & Maths Schools (www.leapschool.org.za/) is a chain of six fee-free private secondary schools in Cape Town, Johannesburg, Pretoria, and Limpopo, South Africa. In 2015, LEAP schools enrolled more than 950 students, all of them from households in the bottom two wealth quintiles. Sixty-five percent of students are girls, and more than 95 percent are black. LEAP innovates in three key ways:

- 1) It selects poor children with potential but no prospect of entering “high-performing” schools.
- 2) Its holistic curriculum prioritizes math, science, “life orientation” classes, and community work. Small classes, an extended school day, and learner-centered pedagogy maximize student-teacher contact time and learning opportunities.
- 3) It has a multi-sector network of local partnerships with private and public schools, community organizations, and government designed to build education alliances.

Central management recruits teachers, handles payroll, and aligns curriculum, teaching practices, and assessment. LEAP is funded by private South African and international donors, as well as government subsidies that cover about 15 percent of student costs.

Impact

LEAP schools have a relatively low dropout rate of less than 6 percent, compared with a national average of 49 percent (City Press 2014). Since 2004 more than 750 students have graduated. LEAP has created jobs for 170 school staff recruited from townships and about 40 African refugees recruited to staff the learning centers. Forty-two former students were enrolled in LEAP teacher training in 2015.

Scaling Up

LEAP's results stem from its rigorous admissions practices, extended contact time with students, low turnover among teachers and school leaders, and regular external and peer evaluations. Its specialized curriculum and use of qualified staff cost USD 3,150 per student a year, roughly twice what public schools spend. Donor funding covered just 85 percent of operational costs. It is lobbying the government to receive the same subsidy as public schools (it currently receives just half as much). Other challenges include students' difficult family circumstances and the shortage of skilled teachers.

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	<p>PROFILE</p> <h2>Omega Schools</h2> <p><i>Low-cost private schools in Ghana with an all-inclusive daily fee</i></p>
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Challenge

Ghana's school system struggles to provide good-quality basic education. Large increases in public school enrolment following the abolition of tuition have led to overcrowded classrooms and declining teaching quality. As a result, there is substantial demand for private alternatives to provide quality education.

Innovation

Omega Schools (www.omega-schools.com) is a for-profit chain of combined primary and junior high schools located in urban and peri-urban communities in Ghana. It offers affordable, easily accessible, and accountable schooling of consistent quality, based on key innovations:

- **Omega charges one all-inclusive daily fee.** The USD 0.57 a day fee in 2015 includes tuition, two uniforms, a school bag, workbooks, and one hot meal a day. Bundling school expenses into one package contrasts with the approach of most private schools, which charge separately for items and require large tuition payments every term. Parents buy Omega daily fee vouchers from third-party vendors, which their children submit to school managers to access lessons. This cashless system mitigates the risk of corruption and nonpayment of school fees.
- **Omega has a “School-in-a-box” model of education,** in which all inputs and processes are designed and implemented by a vertically integrated company that standardizes everything, from buildings to lesson plans. It costs about USD 75,000 to establish a new Omega school with capacity for 500 children. Schools become self-sustaining when enrolment reaches 300 children, according to Omega.
- **Omega uses a proprietary software system** that tracks enrolment, student and staff attendance, and performance. School managers, who are responsible for a cluster of schools, input data via Internet-enabled tablets, enabling the head office to continuously monitor, evaluate, and compare data.



- *Omega trains local young people*, mostly high school graduates, to deliver standardized lessons using materials created by Omega. The lower salary expenses help Omega keep annual costs low. According to the company, Omega spent just USD 113 per student in 2012—about one third less than public primary schools spent—and its fees were lower than 13 of 16 neighboring stand-alone private schools.

Impact

Omega has significantly expanded low-cost private school capacity, scaling rapidly from 2 to 38 schools serving more than 20,000 students within six years. New schools fill to capacity within two weeks of opening, with students coming from other schools, including both public and private schools. According to evaluations conducted for Omega, students perform 15–21 percent better than public school students on English tests and 10 percent better on math; in both subjects, they perform as well as private school students.

Scaling Up

Omega’s understanding of the target market, its lean management structure, a fee model that suits poor households’ cash flow patterns, and its leveraging of economies of scale position it to scale to 100 schools by 2018. Its expansion is propelled by private venture capital, led by the Pearson Affordable Learning Fund. Omega benefits from relatively benign oversight of private investment in education in Ghana. Also, abolition of public school fees and weak public financing has led to deteriorating quality in some public schools, prompting many families to opt for private education. It is constrained by nonpayment of fees, which could put its sustainability into question, especially given the vulnerability of target households to economic downturns.

Improving Learning Outcomes by Bringing Innovation to the Classroom

Low-cost materials and training support novel teaching methods at under-resourced schools

HIGHLIGHTS

- Teaching kits, exchange networks, model schools, and cloud-based platforms can enhance teaching innovation.
- Products and services are designed to work in resource-constrained settings. They come with detailed lesson plans and support, making them ready to use and easy to apply.
- Models leverage ICT and extensive partnership networks, cascade training even to remote areas while keeping operating costs low.



Summary

Most low-income countries suffer major shortages of well-trained teachers—an enormous problem given the importance of good teachers to student learning. Many of these teachers favor lecturing, rote learning, and repetition rather than the innovative techniques that have been found to improve learning outcomes. Training teachers to use innovative techniques and providing them with easy-to-use learning materials can help address the challenge.

Development Challenge

Many teachers in low-income countries lack even basic qualifications and training: In 2013, 22 percent of primary school teachers and 42 percent of secondary school teachers were not trained (World Development Indicators database). These teachers rely primarily on their

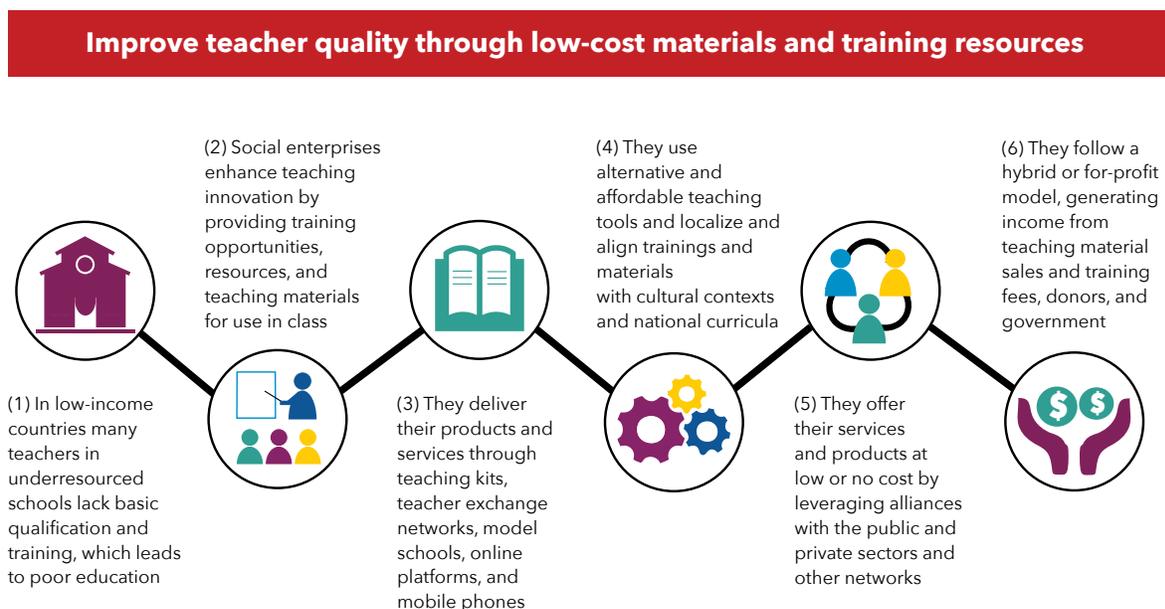
school experiences as children to develop their teaching practices, which usually involve lecturing, rote learning, and repetition.

The lack of trained teachers presents an enormous challenge, because high-quality teachers are the bedrock of all high-performing education systems and the single most important factor in improving student learning (World Bank 2015). Highly effective teachers increase college enrollment and raise salaries (Chetty, Friedman, and Rockoff 2014). Indeed, just replacing a very low-performing teacher with an average teacher can increase the present value of students’ lifetime income by almost USD 250,000 per classroom. Many countries have tried to move toward more innovative, learner-centered methods, but they are limited by low teacher-student ratios, scarce teaching resources, and a lack of professional development opportunities. Ready-to-use and easy-to-apply innovations designed to work in resource-constrained settings can help them improve their teaching.

Business Model

Non-state actors are enhancing teacher quality by introducing innovative teaching practices in low-income school settings (figure 2). They develop innovative teaching concepts in-house or adapt them from internationally renowned approaches. All products and services align with national standards.

Figure 2. Features of model for improving training and resources for innovation in teaching



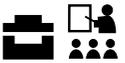
Components of the Model

Models offer teacher training, professional development resources for teachers and schools, and teaching materials for use in class (table 3). Some enterprises develop their own materials. Others source their materials from educational NGOs or involve local teachers in the development and customization of their materials.

Table 3. Products, services, and revenues of selected enterprises providing innovative educational solutions

Model/example/countries	Products and services	Revenue sources
For-profit		
Experifun Learning Solutions (India, the Philippines) 	Tools for experiments and activities in science. Comes with teacher training video, lesson plan user-guide, and workshop.	<ul style="list-style-type: none"> • Investors • Sale of teaching kit (USD 950 per pack containing 80 products)
Karadi Path (India) 	Language instruction materials, audio and video books, which use music and background score to create the natural stimuli to teach English. Comes with training and teacher support.	<ul style="list-style-type: none"> • Investors • Sale of materials and training fees (USD 920 per 120 students in first year; USD 310–390 per renewal per year)
Non-profit		
Digital Study Hall (Bangladesh, India, Pakistan) 	Videos of best-practice teaching, shared online, for use in teacher training and class.	<ul style="list-style-type: none"> • Donor funding
STIR Education (India, Uganda) 	Low-cost teaching innovations disseminated through teacher exchange networks. Training offered by STIR and partners.	<ul style="list-style-type: none"> • Donor funding • Government funding
Hybrid		
Bridge IT (11 countries in Sub-Saharan Africa, Latin America and Caribbean, and South and South East Asia) 	Videos for professional development and teaching in class, delivered through web-enabled mobile phones. Includes training, manuals, and lesson plans.	<ul style="list-style-type: none"> • Private sector contributions • Government funding • Video downloads (USD 0.65 each in the Philippines [free first year])

Table 3. Products, services, and revenues of selected enterprises providing innovative educational solutions (cont'd)

<p>Hands on Tech (South Africa)</p> 	<p>LEGO-based teaching kits for development of math, language, and life skills through creative play. Comes with lesson plans and teacher training.</p>	<ul style="list-style-type: none"> • Donor funding • Sales = of teaching kits (USD 16–420 for preschool and primary school; robotics sets sell for up to USD 1,200)
<p>Lamplimat Pattana School (Thailand)</p> 	<p>In-service training on making teaching student-centered and project-based. School also operates publishing house selling teaching materials.</p>	<ul style="list-style-type: none"> • Donor funding • Government subsidies (about USD 60,000 a year) • Publishing house sales and training fees (USD 10-50 a day)
<p>Limited Resource Teacher Training (7 countries– Uganda, Tanzania, Cambodia, Nepal, Nigeria, India, Guyana)</p> 	<p>In-person and video-based training on learner-centered, innovative pedagogical methods.</p>	<ul style="list-style-type: none"> • Donor funding • Fellowship fees for volunteers (USD 1,700–2,000)
<p>mAcademy (Nigeria)</p> 	<p>Seven-day professional online development courses, accessible via mobile phones.</p>	<ul style="list-style-type: none"> • Private sector contributions • Course fees (USD 0.75 per course). Some courses are free.
<p>Muktangan Schools (India)</p> 	<p>Pre- and in-service training based on child-centered, inclusive education. Additionally, develops teaching materials.</p>	<ul style="list-style-type: none"> • Donor funding • Training fees (about USD 5 per teacher)

Note:

 = teaching materials

 = professional development resources

 = teacher training;

 =ICT -based services

Enterprises disseminate their products and services to teachers and schools in various ways. Hands on Tech sells teaching kits containing teaching materials, manuals, and lesson plans. STIR Education establishes teacher exchange networks. The Lamplimat Pattana School runs a model school that serves as a site for in-service teacher training. mAcademy provides Nigerian teachers with professional development courses via mobile phones.

Cost Factors

Most of the models analyzed follow a hybrid or for-profit model, generating income from teaching material sales (e.g., Experifun Learning Solutions) and training fees (e.g., Muktangan Schools). Karadi Path, for example, grew its revenues from USD 20,400

to 390,000 in its first three years of operation. However, some models rely strongly on financing from governments and donors to cover their operating costs. STIR Education, while in the process of developing a long-term financing strategy, currently depends fully on external funding to cover the average USD 200 it spends per teacher.

Revenue Streams

Some models rely fully on contributions, some try to fund themselves exclusively from revenues, and others use a mix of both. Providers of teaching materials and professional development resources are typically for-profit companies. They generate income from selling teaching resources to schools or individual teachers. Training providers are mostly NGOs or public-private partnerships. They typically generate revenue from training fees and donor and government contributions.

Financial Viability

Existing models combine financing from NGOs, the private sector (notably technology partners), social investors and local governments. BridgeIT sometimes builds on support from the target communities. If government funding and private sector contributions are insufficient to cover roll-out costs for the program, communities contribute their own funds.

Partnerships

To market their products and services, models partner with NGOs and local governments. STIR Education builds on partnerships with more than 50 NGOs that support the identification of promising teachers and disseminate the STIR model within their school networks. In Thailand the government invites schools and teachers to participate in training programs provided by the Lamplimat Pattana School. Several enterprises (the Lamplimat Pattana School, Karadi Path, and the Muktangan Schools) invite communities and teachers to visit their model schools and observe innovative methods in action. Models also collaborate with NGOs, governments, and research institutes to conduct external analyses of their impact. Microsoft Research, for example, supports Digital Study Hall in conducting experiments to assess the impact of its teaching videos.

Implementation: Delivering Value to the Poor

Awareness

To market their products and services, existing models leverage two main channels: partnering NGOs and local governments. STIR Education, for example, builds on partnerships

with over 50 NGOs who support the identification of promising teachers and disseminate the STIR model within their school networks. In the case of Lamplimat Pattana School, the Thai government invites schools and teachers to participate in training programs. Lamplimat Pattana School, Karadi Path and Muktangang Schools invite communities and teachers to visit their model schools and observe innovative methods in action.

Acceptance

To gain acceptance, models localize and align trainings and materials with cultural contexts and national curricula. Experifun Learning Solutions designs science kits and teaching manuals in accordance with the Indian State curriculum as well as international curricula. Recognition by local authorities is a further boost to acceptance. Teachers trained by STIR Education and BridgeIT receive officially recognized training certificates. The Lamplimat Pattana School and the Muktangang Schools have become official teacher training sites. Nearly all models include specific training components on how to implement materials and methods in class. BridgeIT's videos come in a ready-to-use package with detailed lesson plans and teaching manuals. The Lamplimat Pattana School trains teachers to develop progress indicators for project-based learning that enable the translation of student performance to the conventional grading system. Some models promote solutions that have been developed by teachers themselves, helping ensure applicability and increasing acceptance by teachers. STIR Education and the Digital Study Hall use a bottom-up approach in which teachers provide ideas and videos of their own teaching methods.

Accessibility

To maximize accessibility while keeping distribution costs low, many models leverage web-based technology. Teachers can access training and teaching materials from mAcademy and BridgeIT via data-enabled mobile phones. Digital Study Hall works through a web-cloud that teachers use to upload, stream, and download videos. Limited Resource Teacher Training offers video-based training modules online. To increase the indirect accessibility of their products, STIR Education, the Muktangang Schools, and Hands on Tech have adopted a cascade mechanism. They train teachers, school managers, or school cluster coordinators to train other teachers. The growth of the ICT sector in low-income countries is unlocking the potential of mobile and web-based models. By the end of 2014, mobile phone subscriptions were estimated to exceed 6.9 billion, with about 75 percent in low-income countries; mobile broadband penetration reached about 27 percent in 2013 and has grown rapidly since then (UNESCO/ITU 2014).

Affordability

Most models offer their services and products at low or no cost. To be able to do so, they leverage strategic alliances with the public and the private sector for cost-sharing or sub-

sidization. BridgeIT, for example, requires governments and technology partners in the Philippines to each bear about half the costs related to school roll-outs. The Thai National Office of Primary Education provides financial support for teacher training workshops provided by the Lamplimat Pattana School. Models keep operating costs low in several ways. Limited Resource Teacher Training uses volunteer teacher trainers. BridgeIT, mAcademy, and Digital Study Hall, leverage ICT for product delivery. Web-enabled technology has been a key factor for several models to cost-efficiently reach scale, even in remote areas.

Results and Cost-Effectiveness

Scale and Reach

The more established models show that achieving large scale is possible. BridgeIT has reached 15,000 teachers over the past 10 years; the Lamplimat Pattana School trains 40,000 teachers a year.

Improving Outcomes

- ***Learning outcomes:*** An internal evaluation by Digital Study Hall showed positive effects on English and math performance over a three-month period, with children scoring almost 400 percent higher in English and 300 percent higher in math than peers in a comparison school (Global Solutions Network 2013). At the Lamplimat Pattana School, students achieved the highest results on primary-level standardized tests across the province's 860 schools in 2010, according to an internal assessment, placing the school in the top 15 percent nationwide. All of the Muktangang Schools' first batch of grade 10 students scored above 74 percent on the Indian Secondary School Certificate exam (Center for Education Innovations n.d.).
- ***Teacher outcomes:*** In Bangladesh the performance of BridgeIT teachers improved by 50 percent on instructional practice criteria, as defined by the International Reading Association's Diagnostic Teaching Model (Pearson Foundation 2014). In an internal assessment of STIR's pilot network, 100 percent of teachers (from 18 schools) reported increased self-efficacy, and 80 percent took on new leadership roles in driving change initiatives within their school, according to an internal study (STIR n.d.)

Cost-Effectiveness

Rather than provide cutting-edge technology and teaching methods, models such as Limited Resource Teacher Training and STIR Education focus on teaching innovations that are very low cost or free, making them applicable in very resource-scarce environments. Training of trainers is a common feature in many traditional teacher programs. STIR Education, for

example, trains NGOs and government institutions to embed the STIR model. The approach has increased the company's reach in a cost-effective way. In addition to its teacher materials, BridgeIT integrates Microsoft Data Gathering software, through which BridgeIT and its partners can send surveys to participating teachers and schools that help monitor the impact of its service at large scale and low cost.

Scaling Up

Challenges

Many models generate revenues, but most rely heavily on donor support and government subsidies. Overreliance on a few funders carries a risk of financial insecurity, as political or donor priorities shift. The strong financial involvement of governments can ensure a program's integration into the public education system, however. Given the novelty of their approaches, providers face initial low acceptance or interest. To increase credibility and help reduce barriers to acceptance, many conduct regular assessments of their programs' effectiveness. Enterprises that use ICT face additional challenges. Digital Study Hall and BridgeIT depend on reliable power supply for teachers to show their videos in class. BridgeIT addresses this issue by including solar chargers in its packages. The outreach of mobile-based models such as mAcademy and BridgeIT is limited to teachers and schools with 3G connectivity. To reach unconnected schools, BridgeIT delivers USB-sticks with preloaded videos and helps communities develop partnerships with connected schools so that they can access new videos.

Role of Government and Public Policy

Government plays a critical supporting role in education innovating, in a variety of ways:

- **Outreach and promotion.** In South Africa and Uganda, local departments and officers of education help Hands on Tech and Limited Resource Teacher Training identify and select the schools that are most suitable for training.
- **Endorsement and accreditation.** In India and Thailand, the ministries of education have accredited the Muktangan Schools and the Lamplimat Pattana School as official teacher training programs and sites.
- **Mainstreaming.** In India, the STIR Education model is partly embedded in the public teacher training system. In the Philippines, Bridge IT trains education officers to implement and mainstream the program.
- **Evaluation.** In India, the State Institute of Education in Goa supported Karadi Path by conducting a study on the effectiveness of its methodology in 20 schools.
- **Financing.** In the Philippines, local governments bear about half of the cost BridgeIT incurs per school. In India Experifun Learning Solutions received funding from the Department of Industrial Policy & Promotion.

Table 4. Social enterprises: Providers of innovative educational products and services

<i>Company</i>	<i>Country</i>	<i>Description</i>
Bridge IT	Bangladesh, Chile, Colombia, Haiti, India, Indonesia, Nigeria, South Africa, Viet Nam, Tanzania	Uses mobile phones to deliver professional development materials and educational resources (videos, lesson plans, online network) to teachers. Schools receive a package containing a mobile phone, through which they can download educational content and teacher training material. Package includes a cable, projector, and screen for showing videos in class.
Digital Study Hall	Bangladesh, India, Pakistan	Delivers education to low-income students in slums and rural villages via lectures and lesson plans on DVD. Company tapes India's best teachers as they teach the local state curriculum in their local languages and distributes the DVDs to schools in need.
Experifun Learning Solutions	India, the Philippines	Offers tools for innovative experiments and activities in science to help teachers engage students. Every Experifun product includes user manuals, training videos, and opportunity to participate in lesson-planning workshops.
Hands on Tech	South Africa	Encourages learning through play by providing preschools and primary schools with Lego teaching kits based on LEGO innovation. Resources are embedded in a one-year teacher support program, including training and follow-up visits.
Karadi Path	India	Offers low-cost English language learning solutions for students in rural, semi-urban, and urban areas. Teaching kits contain audio and video books, which use music and background scores to create the natural stimuli to teach English. Products are designed in-house using a methodology based on how children pick up their mother tongue.
Lamplimat Pattana School	Thailand	Private school in rural Thailand uses alternative pedagogical model and functions as model school and teacher training site. Multiday courses and in-depth workshops (during summer vacations) provide public school teachers and administrators with training to revise their classroom practices and raise their expectations of public education. School also operates a publishing house that publishes alternative curriculum material and educational literature.
Limited Resource Teacher Training	Cambodia, Guyana, India, Nepal, Tanzania, Uganda	Provides month-long training programs delivered by qualified volunteer teachers from the United Kingdom and the United States. Training includes on-site training and online courses.
mAcademy	Nigeria	Provides educational contents and more than 300 courses via mobile phones and data-enabled devices. Courses are available for seven days. After completion, users can download training certificates.
Muktangan Schools	India	Implements alternative teaching methodology in network of community schools. Their Teacher Training Center and Education Resource Center promotes its methodology by developing teaching and learning materials, conducting long-term teacher trainings, and leading workshops. Teacher education program develops skills of local people from marginalized communities, predominantly women.
STIR Education	India, Uganda	Creates networks of promising teachers from low-income schools to exchange and develop innovative practices that can improve learning outcomes and help teachers become innovation leaders within their schools.

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	<p>PROFILE</p> <h2>STIR Education</h2> <p><i>Building a bottom-up movement of teacher “change-makers” to improve the quality of education at resource-scarce schools</i></p>
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Challenge

On any given day, 27 percent of teachers in Uganda and 25 percent of teachers in India are not at school (Transparency International 2013). When they are in school, they spend only about half of their time teaching. One reason absenteeism is high is that teachers are not respected and therefore often lack motivation. Reducing absenteeism is critical, because teachers are a major determinant of both success in school and students’ subsequent earnings.

Innovation

STIR (Schools and Teacher Innovating for Results) Education (www.stireducation.org) seeks to change the image, self-perception, and motivation of teachers by turning them into active shapers of the education system. It creates networks of promising teachers from low-income schools, who exchange innovative practices that can improve students’ learning outcomes.

STIR networks act as “teacher self-help groups” in which teachers meet monthly to discuss teaching problems and develop solutions. STIR promotes small innovations that can be applied at low or no cost, making them applicable and affordable in low-income school settings. Areas of innovation include student learning assessment, parental and community engagement, classroom practice, and English and math. These micro-innovations are available as books and downloads on the STIR website. STIR spends an average of USD 200 for each teacher reached. Each STIR network includes about 40–50 teachers from 15–20 schools.

Impact

Since its launch in 2012, STIR has trained more than 12,000 teachers across 3,890 schools and reached more than 481,000 children in Uganda and India. An internal assessment of the program in Delhi indicated that 100 percent of the selected teachers (from 18 schools)



reported increased motivation and self-efficacy and 80 percent took on new leadership roles within their schools. All participating teachers said the increased opportunities for interschool collaboration had increased their repertoire of effective teaching and school management practices.

Scaling Up

STIR acts as a connector and amplifier, tapping into and linking existing resources, an approach that has allowed STIR to leverage a base of more than 50 partners and quickly reach large scale. STIR's model is based on a cascade mechanism, in which it trains other organizations to implement the STIR model and establish teacher networks. Local ownership and implementation increase acceptance in the community and ensure the networks' usefulness for teachers. Use of a cascade mechanism is also cost-efficient. In India, STIR trains public teacher training coordinators, who then act as multipliers of the model and the micro-innovations.

STIR lacks a revenue model that would allow it to generate enough income to cover operating costs. This lack of revenue makes it difficult to reach STIR's objective of reaching one million teachers by 2022. To address this challenge, STIR is currently exploring ways to generate revenues through franchise fees, consulting service fees, or government contributions.

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	<p>PROFILE</p> <p>BridgeIT</p> <p><i>Enhancing teaching quality and resources by providing teachers with ready-to-use lessons via mobile phones</i></p>
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Challenge

Information and communication technology (ICT) can improve learning—but its value depends on teachers’ knowledge and ability to use it as an effective educational tool (UNESCO 2015). In many countries, teachers lack the competencies to harness ICT. In Chile and Colombia, only 1–2 percent of secondary teachers had basic ICT skills in 2012; in the Philippines, only 5 percent were trained to use ICT for teaching (UNESCO 2012). The challenge is how to use ICT effectively to improve learning outcomes.

Innovation

BridgeIT, a public-private partnership founded in 2003, makes use of the wide availability of mobile phones to offer digital teaching content and professional development resources to teachers in hard-to-reach schools. It provides schools with a mobile phone equipped with the Microsoft Education Delivery system, a cloud-based platform that delivers access to educational content (short video and audio files). Using 3G connectivity, schools and teachers can download the contents and project the videos on a TV screen. BridgeIT’s model features innovation at four levels:

- 1) **Combining global and local actors in each country.** BridgeIT sources technology (Microsoft) and educational content (Pearson Foundation), which it then localizes through local partners.
- 2) **Involving teachers in content creation.**
- 3) **Developing holistic capacity.** BridgeIT trains teachers on how to integrate their material.

- 4) *Providing ready-to-use material.* BridgeIT designs a comprehensive lesson plan around each video.

Impact

BridgeIT has been implemented in 11 countries, where it has trained more than 15,000 teachers in more than 2,200 schools, reaching an estimated 700,000 students. Assessment by the Pearson Foundation (2014) suggests that it has improved teaching practice and learning outcomes. In Bangladesh, teacher performance on instructional practice criteria (as defined by the International Reading Association's Diagnostic Teaching Model) improved by 50 percent. In Chile students at BridgeIT schools scored 12 percent higher in science and 10 percent better in English than their counterparts at non-BridgeIT schools.

Scaling Up

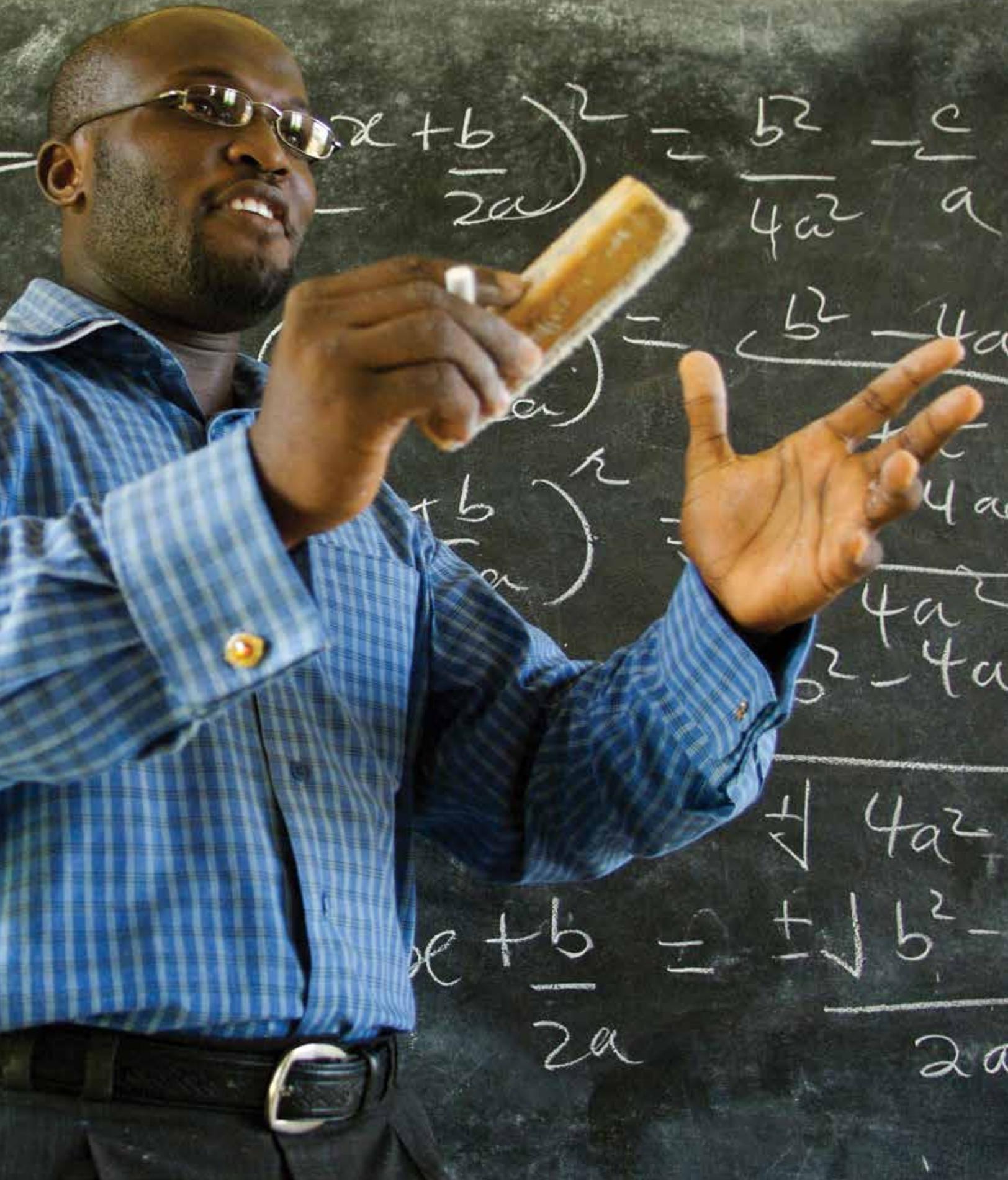
BridgeIT offers its service free of charge by relying on funding from its partners, including donors and governments. Four factors drive BridgeIT's growth: flexibility and localization of materials; emphasis on saving teachers time; government involvement in implementation; and effective use of ICT in a holistic way. BridgeIT was founded as a public-private partnership between Nokia and the Pearson Foundation. Following the 2014 merger between Nokia and Microsoft, support to BridgeIT declined. The same year, the Pearson Foundation



closed, cutting off the supply of new educational content. To address the financial sustainability problem, in each country of operation, BridgeIT is working with local partners to develop long-term funding.

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$$\left(\frac{b}{2a}\right)^2 = \frac{b^2}{4a^2} - \frac{c}{a}$$

$$= \frac{b^2 - 4ac}{4a^2}$$

$$\left(\frac{b}{2a}\right)^2 = \frac{b^2 - 4ac}{4a^2}$$

$$\pm \sqrt{4a^2}$$

$$\frac{b}{2a} \pm \frac{\sqrt{b^2 - 4ac}}{2a}$$

Evaluating Schools and Helping School Management Improve Education

Evidence-based school assessments and advisory services are driving improvements in school quality

HIGHLIGHTS

- Publicly available school rating systems allow parents to compare schools, helping them choose the best school for their children.
- A holistic approach to school quality improvement replaces piecemeal approaches.
- Data-driven evaluations replace proxy measures of school quality.



Summary

Schools that serve children at the bottom of the pyramid (BoP) usually lack reliable measures of quality and comprehensive strategies for improvement. To fill this gap, social enterprises conduct evaluations, present school management with evidence-based results, and craft action plans to improve the quality of the education they provide

Development Challenge

Schools and education authorities in developing countries often lack the skills and resources to systematically monitor, evaluate, communicate, and subsequently improve the quality of the education they provide to children at the BoP. Hence, parents have little way of knowing which schools are best, relying on proxy measures, such as a school's physical facilities.

These shortcomings contribute to a situation in which, despite completing four years of primary school, more than 125 million children worldwide do not achieve minimum standards of numeracy and literacy (UNESCO 2015).

Providers of school evaluation and management support services assess school quality and learning outcomes using multiple data-based indicators, such as grade-level tests and comparisons of attendance and enrollment figures, to generate school ratings or student report cards. They then work with schools to develop and implement whole school improvement plans (WSIPs). Assessments focus on school leadership, learning outcomes, financial and staff management, long-term planning, monitoring, and community relations. The goal is to improve learning outcomes, empower parents to make better decisions in choosing the best schools for their children, and help school management improve the quality of the education they provide.

Business Model

Components of the Model

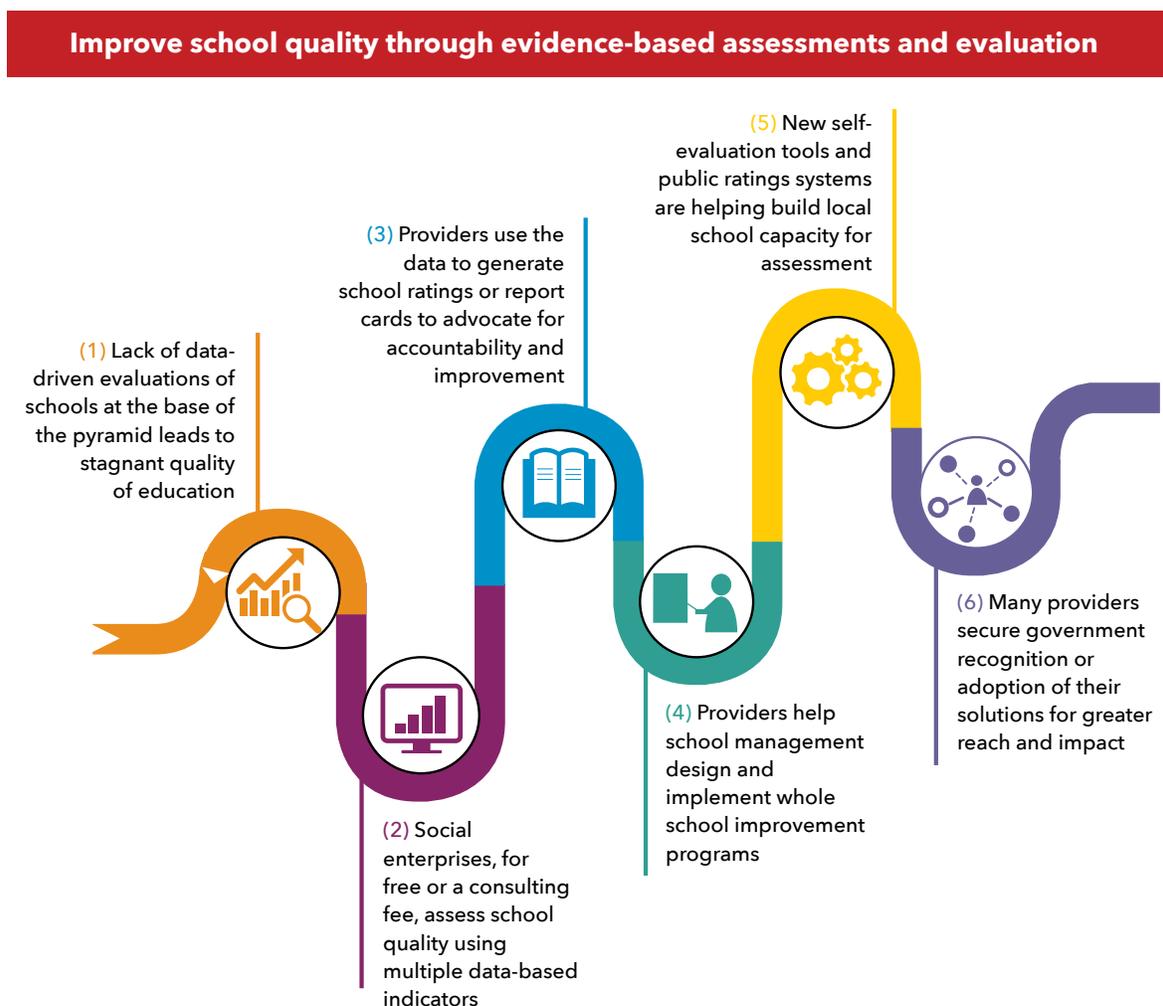
Services are typically offered by education-focused NGOs as one element of their project portfolios, although some for-profit enterprises, such as Gray Matters India (GMI), are also active. Providers conduct school evaluations and offer advisory services and school management consultancy to private schools in return for fees or to public schools under public-private partnership (PPP) arrangements funded by donors.

Several providers charge low- to medium-cost private schools for assessments. GMI has developed an innovative school rating system that parents can use to compare schools. Idara-e-Taleem-o-Agahi (ITA) has replicated this model in Pakistan. CfBT India offers private schools customized improvement plans and training packages. The Teacher Foundation's Whole School Turnaround program targets affordable schools.

Providers typically follow a four-phase approach (see figure 3):

- 1) Providers collect data on standardized indicators, including student and teacher tests, classroom observations, management interviews, infrastructure audits, and parent satisfaction surveys.
- 2) They analyze the data to generate school performance diagnostics, recommendations, and school report cards or ratings.
- 3) They craft action plans, which they present to school management and other stakeholders, and help formulate and implement school improvement plans.
- 4) They monitor implementation of action plans. Some enterprises also provide teacher/management training and other capacity-building support. Others introduce schools to third-party providers, such as microfinance institutions or specialists.

Figure 3. Features of school evaluation business model



Cost Factors

Link Community Development International (LCDI) reports that training of data collectors, school assessment, and community engagement services cost about USD 107 per school. The Teacher Foundation’s proposal for funding includes a cost of USD 12,600 for a two-year intervention, of which the school pays 25 percent. In its first year of operation, GMI spent about USD 1,000 to assess a 400-student school.

Revenue Streams

An individual school of 300–400 students pays USD 600–1,200 for GMI’s school assessment according to a pricing scheme based on the number of students tested. GMI reports that its revenues largely covered its operating costs in 2014–15. However, some contracts generated

losses when schools did not submit enough students for testing, forcing GMI to rethink its fee structure, introduce a minimum charge, and change its focus on individual student assessments from school assessments.

A key variation on the model is for providers to supply school administrators with self-evaluation tools or training designed to build local capacity to assess progress without external intervention. Examples include JET Education Services' monitoring dashboard, the GM South Africa Foundation's Learning Schools Initiative Self-Assessment Instrument, and Fundación Chile's free online self-evaluation tool, which allows all stakeholders, including parents and children, to contribute feedback on school performance. LCDI trains district education officers and head teachers in rural Africa to collect data for its School Performance Review and facilitates stakeholder meetings to formulate school action plans. The objective is to build the capacity of school districts to self-evaluate and to encourage government adoption of similar systems of school assessment.

Another variation of the consultancy model is the Impact Network's eSchool360 package. It provides Zambian schools with a whole school management kit that includes e-learning hardware (projectors, laptops, and tablets); lesson plans; a solar electric system; operating manuals; and logistical support.

Financial Viability

Most providers are NGOs dependent on donor funding or government grants for specific projects, although some also charge fees to help cover costs. Recent interventions by JET Education Services in government schools required 95 percent funding from donors.

Limited funding and revenues from fees is frequently cited as a key constraint on viability. Many low-cost private schools lack the funds to pay for evaluations. GMI has developed an alternative revenue stream by conducting multi-school impact evaluations on behalf of corporate clients and researchers who are piloting education solutions. Its experience suggests that for-profit enterprises serving the BoP may struggle to sustain the training and capacity-building programs that donor-funded NGOs with large project portfolios are providing.

Partnerships

Investors and foundations provide grants, loans and equity financing to service providers primarily to cover capital expenditure and start-up costs. For instance, Gray Ghost Ventures' investment enabled GMI to build its management team, develop their products, conduct pilots, and support overheads. In 2013, Michael & Susan Dell Foundation also invested USD 750,000 in GMI which helped them further develop products, build analytics framework, and scale their services across more states and schools in India.

Implementation: Delivering Value to the Poor

Awareness

Providers share and publicize the results of their evaluations to advocate for school evaluation as a means of improving accountability and quality. GMI publishes school ratings on its website; it releases individual student learning outcomes in a detailed report card. LCDI presents the findings of its School Performance Reviews to stakeholders and at conferences. CfBT India offers orientation sessions on key learning milestones as part of its program. Providers with large education project portfolios or networks of partners leverage these results to promote evaluation services. GMI positions itself as a key player within the community of private schools, hosting free workshops featuring vendors of education solutions and dedicated workshops for parents and sponsoring school association meetings. ITA invites schools to attend “solutions marketplace” events and customizes a website for each school client.

Table 5. Clients, revenue models, and services of selected providers of school assessment and advisory services

<i>Provider</i>	<i>Countries</i>	<i>Clients and revenue model</i>	<i>Services</i>
Fundación Chile, Gestión y Liderazgo Escolar initiative	Chile, Brazil	<ul style="list-style-type: none"> • Public schools and principals receive services for free • PPP with Ministry of Education • Donor funded • Non-profit 	<ul style="list-style-type: none"> • Online school self-evaluation surveys and tools • School leadership and management training for school principals • Online resources for teachers
GM South Africa Foundation, Learning Schools Initiative	South Africa	<ul style="list-style-type: none"> • Public schools and school staff receive services for free • PPP with Ministry of Education • Donor-funded by private foundations and trusts • Non-profit 	<ul style="list-style-type: none"> • School self-evaluation tool and database • School management and teacher training • Financial aid for improvements • Advisory services and monitoring
Gray Matters India	India	<ul style="list-style-type: none"> • Affordable private schools purchase services • School administrators purchase multischool evaluations • For-profit 	<ul style="list-style-type: none"> • Whole school evaluation • Student and teacher testing • Data analysis and school rating • Advisory services and monitoring • Recommendations on solution providers

Table 5. Clients, revenue models, and services of selected providers of school assessment and advisory services (cont'd)

<i>Provider</i>	<i>Countries</i>	<i>Clients and revenue model</i>	<i>Services</i>
Idara-e-Taleemo-o-Agahi (ITA) School Assessment for School Improvement Program (SASI) and Whole School Improvement Program (WSIP)	Pakistan	<ul style="list-style-type: none"> • Private schools pay fees for SASI program; public schools receive WSIP services for free under PPP arrangements • Donor-funded by NGOs, companies, and individuals • Non-profit 	<ul style="list-style-type: none"> • Whole school evaluations and needs assessment • School development planning • School management and teacher training • Advisory services and monitoring • Facility renovation
STIR Link Community Development International (LCDI)	Ethiopia, Ghana, Malawi, Uganda	<ul style="list-style-type: none"> • Rural public primary schools receive services for free • PPP with school districts, which provide staff and in-kind support • Grant-funded by overseas development agencies • Non-profit 	<ul style="list-style-type: none"> • School Performance Review (SPR) (whole school evaluation) • Training for school district staff and teachers to collect SPR data • Data analysis and advisory services • Solar Connect information and communications technology (ICT) program to build reporting capacity

Acceptance

Providers serving public schools align with government policies targeting systemic improvements in school quality; they target entire districts of schools to demonstrate the scalability of their solutions. Providers serving private schools suggest ways for their clients to differentiate themselves for their competitors, primarily through improved student achievement and increased parent satisfaction rates.

In both cases, evaluation and school improvement is a participatory process, which facilitates acceptance of these initiatives. Students, staff, governing bodies, and parents all contribute inputs. Although providers prescribe remedies, schools discuss and ratify action plans. Self-evaluation tools supplied by providers allow schools to build their professional capacity and take greater ownership of the process.

Accessibility

Many providers work to secure government recognition or adoption of their solutions. They collaborate with education authorities to affect large numbers of schools by rolling out district-level interventions. Self-evaluation instruments build schools' capacity, allowing better access to school information by parents. CfBT trains schools on School Self Reviews, the GMSA Foundation has made its Whole School Self-Evaluation instrument freely available online, and Fundación Chile has developed an online self-evaluation tool.

Affordability

Fee-charging consultancy providers like GMI, ITA, and CfBT offer stand-alone services as well as their WSIP, which they sometimes cross-subsidize depending on their service packages with individual schools. This flexibility allows budget-constrained schools to limit their expenditure to school audits or student assessments. Providers try to restrict their school action plans to the most pressing needs and avoid recommending large investments, focusing instead on optimizing the use of existing resources. LCDI, for example, trains district education officers to collect school data. JET trains government teachers in schools in which it intervenes.

Results and Cost-Effectiveness

Scale and Reach

Most school evaluation and management providers emerged only in the past decade, in part in response to the need to evaluate emerging low-cost private schools. They have scaled rapidly in a short period of time by tailoring their services to the needs of low-cost schools. Since 2009, for example, GMI has worked with more than 1,000 schools, both private and public, assessing more than 350,000 students in nine Indian states (Kanth 2015). Between 2000 and 2012, ITA's WSIP benefitted 3,000 head teachers, 15,000 teachers, 15,000 school management committee members, and 350,000 students. JET's current projects (active 2009–17) include the District Intervention Program, which is working with 3,462 schools, which serve about 2 million students. LCDI is currently affecting 215,000 students in more than 230 schools in Malawi alone.

Improving Outcomes

There is evidence of improved student achievement in schools that use these services. LCDI-supported schools in one Ugandan district performed 45–55 percent better on examinations than control group schools, according to an independent evaluation (Government of the Netherlands 2008). Students in JET's Khanyisa Project performed 5 percent better in mathematics and literacy than students in nonproject schools, with scores at 59 percent of project schools improving by 5–42 percent (Joint Education Trust Education Services. 2012). GMI reports that client schools assessed over two consecutive years show double-digit improvements in English and math. A self-evaluation of Impact Network's eSchool360 package found that over an 18-month period students' standardized test scores rose 7 percent in literacy and 25 percent in numeracy (Impact Network International 2014).

School management has also improved in response to interventions and recommendations. ITA observed higher rates of tuition collection among low-cost private schools after it recommended that schools introduce tuition fee vouchers and direct bank transfers. After

LCDI conducted School Performance Reviews, all 368 primary schools in the Dedza and Mulanje districts of Malawi developed a school improvement plan and almost 1,000 teachers and head teachers received school management and teacher training. GMI found that in more than 650 schools assessed for two consecutive years there was an average 15 percent increase in student enrollment and a 24 percent increase in parent satisfaction, indicating improved management. JET reports that a UK Department for International Development assessment of its Khanyisa Project observed improved curriculum management practices among more than 60 percent of teachers (Joint Education Trust Education Services 2012).

Cost-Effectiveness

There is limited data regarding the per-unit costs of most projects. LCDI's management reports that training of data collectors, school assessment and community engagement services cost approximately USD 107 per school but provide no further data. Likewise, a Teacher Foundation proposal for funding assumes a cost of USD 17,000 for a two-year intervention. The Impact Network reports the cost of operating an eSchool360 is USD 3 per student per month, less than a third the cost of government schools. Gray Matters India reports its revenues largely covered operating costs in 2014–15. However, some contracts made a loss when schools did not submit enough students for testing, forcing the company to rethink its fee structure and introduce a minimum charge.

Scaling Up

Challenges

Acceptance remains a major challenge. ITA found that less than 30 percent of private schools want to be evaluated. GMI observed that only about 10 percent of school leaders fully accept evaluation as a tool for school improvement. JET reported that school managers perceived the assessment process as a bureaucratic requirement. The GMSA Foundation found that some schools find the scope of evaluation and remedial measures overwhelming. There may also be political resistance to private sector interventions in public schooling.

Some providers rely on time-limited grant funding to sustain large-scale interventions. Lack of funds forced one JET program to end two years early. LCDI notes that project funding cycles are typically too short to adequately assess impact. GMI reports that many low-cost private schools lack sufficient funds for evaluation. In three Pakistani provinces, the majority of private schools refused ITA's evaluation services because of lack of funds.

Human and technical resources are limited. JET found that most schools lack data-gathering systems, leading to unreliable school data. Both ITA and LCDI observed that finding good data analysts is challenging. LCDI also note the lack of efficient data storage and communications facilities in poor school areas.

Role of Government and Public Policy

The government can do much to improve the quality of education of children at the BoP. It can provide school quality frameworks, adopt policies that promote school evaluation, support provider solutions, and partner with providers.

Governments can establish indicators of school quality and improvements to guide providers' solutions. LCDI consults with national governments to help adapt its School Performance Review process. South Africa defines guidelines for nine areas of school evaluation including leadership, management and governance. To further enhance quality frameworks, governments could augment guidelines by creating formalized accreditation or rating schemes for schools undergoing evaluations and improvement programs or by sponsoring independent research on cost-effective improvement solutions in order to establish a robust knowledge base.

Government adoption or promotion of WSIP principles can be an effective means of improving learning outcomes and school standards. South Africa's Whole School Evaluation policy places responsibility for quality assurance with school principals and governing boards; its strategy requires annual reviews. In India the state of Haryana has introduced a school Quality Improvement Program (QIP) and monthly tests (Daily Pioneer 2015; Economic Times 2014). Ethiopia, Malawi, Pakistan, and Uganda also have policies promoting evaluation and school improvement packages. Such policies are catalysts for wider acceptance of school quality as the key indicator of success in education systems that traditionally measure success by inputs such as enrolment figures and school construction.

Some governments are integrating evaluations into their systems. The Ugandan government's Monitoring Learner Assessment is an adaptation of LCDI's School Performance Review. Malawi is developing its own version. The South African authorities adopted the GMSA Foundation's school self-evaluation instrument and database, piloting them in more than 350 schools. The government of Chile adopted the Fundación Chile's online self-evaluation, which was being used in 37 percent of urban Chilean schools as of 2013. L'Hermitage Foundation is replicating the Chilean model in Brazil.

PPP arrangements underpin some programs in public schools. Legal arrangements define expectations, goals, and cancellation terms and may mandate participation of government officials. The government acts as regulator and enforcer. In some cases (LCDI, JET), it provides in-kind support covering some project expenses.

Table 6. Social enterprises: School evaluation and management

<i>Company</i>	<i>Country</i>	<i>Services</i>
CfBT Education Services India	India	Offers customized Whole School Improvement Program (WSIP) for schools and training packages for managers, teachers, students, and parents. Baseline school evaluation guides designs and action plans.
Fundación Chile	Chile	Offers schools free online self-evaluation tool that solicits input from all stakeholders, providing diagnostic that informs school improvement plans. Also provides teacher training programs.
GM South Africa Foundation	South Africa	Three-year program of support offers free school evaluation instrument. Also offers capacity-building training programs and in some cases funding.
Gray Matters India (GMI)	India	Conducts data-driven school evaluations, testing students and teachers and surveying school leaders and parents. Produces diagnostic reports and school ratings, offers advisory services and WSIPs, and recommends providers of education solutions.
Idara-e-Taleemo-o-Agahi (ITA)	Pakistan	School Assessment for School Improvement (SASI) program charges schools for assessments, which include student tests, teacher competency, interviews with school leaders, parent satisfaction surveys, and financial and infrastructure audits. School management uses Strength-Weakness-Opportunities- Threats (SWOT) analysis to guide improvement plans. SASI introduces schools to providers of solutions, including microfinance providers.
Impact Network International	Zambia	Provides community schools with comprehensive eSchool360 kit, which includes e-learning hardware, lesson plans, and a school management manual.
JET Education Services	South Africa	Partners with public education authorities to implement school improvement programs utilizing JET self-evaluation tools and processes, which guide remedial measures and monitor progress, particularly in curriculum management. Surveys parents and students on their views of school management.
Link Community Development International (LCDI)	Ethiopia, Ghana, Malawi, South Africa, Uganda	Partners with rural school districts to train educators to gather and analyze data to produce recommendations school uses to formulate action plan. Process conducted for all schools in a district, building a systemic picture of school quality. LCDI co-facilitates meetings to formulate district-level improvement plans and offers a Solar Connect program that enables schools to use ICT and share data.
The Teacher Foundation (TTF)	India	Whole-School Turnaround program offers private schools audits based on 67 indicators. Over a two-year period it provides teacher training, advice on curriculum design, and a leadership and management program. It has also developed a self-evaluation tool enabling schools to interpret their own performance data.

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	<p>PROFILE</p> <h2>Gray Matters India</h2> <p><i>Helping to transform the quality of low-cost private schools through data-driven school assessment and evidence-based analytics</i></p>
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Challenge

India has more than 300,000 private schools, most of them catering to low- and middle-income families. Because there is no reliable system to assess school quality, parents and schools rely on word-of-mouth and proxy measures—indicators that provide only a partial view of quality. Moreover, schools at the base of the pyramid typically lack the resources to self-evaluate and measure quality, hindering their ability to make systemic improvements.

Innovation

For-profit Gray Matters India (www.graymatters.in) provides school assessment and improvement services to two key target markets: individual “affordable” private schools (which typically charge USD 10–24 per month) and education enterprises (companies, foundations, and research bodies) piloting educational solutions in multiple schools. Gray Matters India charges approximately USD 2.40–3.00 per student for a one-time school assessment and USD 1.50–2.00 per student per subject for student assessments.

Gray Matters’ model features key innovations:

- ***Data-driven diagnostics tools*** that assess schools and provide guidance on remedial measures to enable whole-school improvement in five areas: student learning, teacher competency, school management, learning infrastructure, and parent satisfaction.
- ***School ratings database***, made publicly available on the Gray Matters India website for a comparison of schools. An automated platform analyzes the data and generates a school rating.

- ***Recommendations and an action plan*** based on the data and a planning workshop with school leaders and teachers. The school implements the action plan, monitored by Gray Matters India at certain intervals.

Impact

Gray Matters India has worked in nine Indian states, with 1,000 schools assessed, which has affected more than 15,000 teachers and 320,000 students. In 2014, it assessed 452 schools, affecting 50,000 students. A year after implementing the recommendations, schools surveyed showed average improvements of 19 percent in English and 10 percent in math, a 15 percent increase in enrolment, and a 24 percent increase in parent satisfaction.

Scaling Up

Several factors are driving expansion, including demand among school leaders for credible ways to differentiate and improve, the company's modular solutions and automated diagnostics, and a focus on using existing and free online resources.

The company also faces several constraints. Convincing school leaders of the need for external assessment and feedback is often difficult. Some question the company's credentials, since there is neither an accreditation system nor an established market for school assessments. Parents lack awareness of data-based methods of evaluating schools. In addition, most low-cost private schools lack the budget for assessment solutions and capacity-building interventions.

	<p>PROFILE</p> <h2>Link Community Development International</h2> <p><i>Enabling African public primary schools to evaluate their performance and plan improvements</i></p>
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Challenge

Many African countries lack reliable data about primary school quality, hindering efforts to improve learning and completion rates. Teachers and administrators lack the data, skills, training, and resources to monitor schools. These deficits make improving schools challenging.

Innovation

The non-profit Link's School Performance Review (www.lcdinternational.org) process gathers and evaluates school data, enabling local educators to improve schools based on better information than government statistics provide. The reviews build the capacity of school communities and district education authorities to conduct evaluations and create and implement school improvement plans. The long-term goal is for governments to adopt their own data-driven evaluation systems.

First introduced in Ghana and South Africa and then replicated in Ethiopia, Malawi, and Uganda, the Link model introduces four innovations to rural schooling systems:

- 1) Whole-school evaluation, analyzing data collected from all stakeholders
- 2) District-wide school system evaluation and improvement
- 3) Stakeholder-driven school and district-level improvement planning
- 4) Solar-powered Internet connectivity through the Solar Connect program, enabling school reporting and data exchange

The training of data collectors, delivery of School Performance Review, and convening of community and district meetings costs approximately USD 107 per school. The Solar Connect system costs approximately USD 3,300 per school to install.

Impact

Since its founding, Link has worked in more than 3,000 schools and improved the education of more than three million children. Approximately 213,000 students in Malawi and 109,000 students of Ethiopia were reached in 2015. Link has established student computer clubs and generated income for schools from mobile phone-charging stations. Anecdotal evidence suggests that Solar Connect has helped to reduce teacher absenteeism, increase student attendance, and familiarize students with information communication technology (ICT) and printed examination papers.

Scaling Up

Ethiopia, Malawi, and Uganda have embraced the principles of the School Performance Review, adopting policies promoting whole-school evaluation and improvement. A key factor for acceptance is that the School Performance Review measures performance against government-approved indicators of school quality.

Several factors constrain prospects for expansion. The three-year project funding Link typically receives is inadequate for measuring long-term impact. For governments implementing School Performance Review-like systems, the challenge is covering the expenses Link currently funds. School Performance Review requires a corps of data collectors that have knowledge and experience to make value judgments and score schools against indicators. Also, stakeholders in rural communities sometimes lack the skills, confidence, or motivation to participate in the review process and take responsibility for school quality improvement.

Expanding Access to Employment and Higher Education Opportunities through Rapid IT Skilling

Socially responsible providers of business process outsourcing services improve post-secondary education opportunities for disadvantaged youth in remote areas through vocational training

HIGHLIGHTS

- The growing digitization of business outsourcing processes and virtualization of the workplace expand remote service range.
- Companies use the profits generated from their outsourcing activities to cross-finance pre- and in-service vocational training, education scholarships, or student loans
- They leverage their ICT-based models to increase education and employment opportunities in rural areas and provide low-cost access to education to youth and others, such as women and the disabled.



Summary

Education-oriented providers of outsourcing services support disadvantaged youth by offering them employment in the business process outsourcing (BPO) sector and providing them with vocational training. Going beyond mere up-skilling of in-house personnel, these providers holistically support youth in transitioning to employment outside the company by offering work/study programs that combine part-time employment with university studies, career guidance and job interview training. Education-oriented outsourcing service providers are generally funded through the income generated from the outsourcing services they provide. However, some additionally use external funding such as donations or subsidies to fund their education activities.

Development Challenge

Youth unemployment has increasingly become a global concern. In 2013, the global youth unemployment rate reached 13 percent—almost three times as high as the overall unemployment rate (ILO 2014). About 90 percent of the global youth population lives in low-income regions (ILO 2013). Of those in employment, many work in the informal sector, under unstable and poorly-paid conditions. They often lack access to training and job opportunities that could help them transition into better-paid, formal employment.

Business Model

Impact Sourcing Service Providers (ISSPs) run companies that provide business process outsourcing (BPO) services with the objective of creating social impact. Similar to traditional BPO service providers, ISSPs base their model on taking responsibility for specific business processes or operations from other companies. Services range from simple tasks such as transcriptions or data entry to more complex tasks such as programming. In Kenya, for example, Daproim Africa offers software development and e-learning services. ISSPs offer the same value proposition as traditional BPO providers by enabling operational savings and efficient expansion strategies.

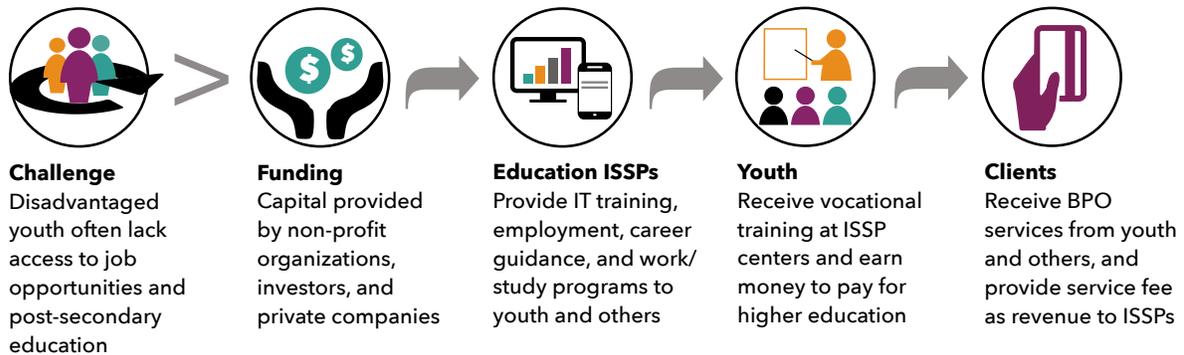
Unlike traditional providers, ISSPs add further social value to their propositions. They specifically recruit low-income youth and some favor disadvantaged women (iMerit) or persons with disabilities (Digital Divide Data). They provide them with employment in the formal sector, above average wages, and often social security or health benefits. At Digital Divide Data (DDD), for example, all employees are provided with healthcare.

Education ISSPs design their business models to expand access to post-secondary education for their target group. They provide comprehensive vocational training before and on the job, either provided in-house, through a sister company or partner organizations. Some Education ISSPs provide additional opportunities to pursue higher education. Daproim, Digital Divide Data and Invincible Outsourcing have developed work/study programs by which employees can study at university while working part-time at the ISSP.

Education ISSPs are typically for-profit companies, generating revenues from BPO service fees charged to clients (private companies, public institutions, or non-profit organizations). Some Education ISSPs are based on a hybrid financial model. Digital Divide Data receives additional financing and in-kind donations. Rural Shores receives subsidies from the Indian government.

Components of the Model

Figure 4. Features of the outsourcing services model for employment and education opportunities



Cost Factors

Data on cost-coverage is not available for all of the education ISSPs analyzed. However, examples suggest that ISSPs in the education sector can reach breakeven. Digital Divide Data’s Asian centers broke even in 2013 and Daproim in 2010. Overall, rural BPOs are estimated to break even when reaching turnovers of about USD 225,000 (India Brand Equity Foundation 2015).

For an initial investment, for example, Rural Shores invests about USD 95,000 in establishing a rural BPO center (India Now Business and Economy 2015). In Nairobi, Daproim started off with a two-computer office at about USD 1,000, and invested about USD 5,100 when moving into a 10-seat office.

Digital Divide Data recorded global operating costs of approximately USD 7.9 million in 2014. According to its CEO, Daproim’s annual operating costs typically range from USD 200,000 to 300,000. Operating costs tend to be lower for rural ISSPs than for urban ISSPs. While rural areas may have additional costs related to last-mile connectivity, they also enjoy savings on other costs such as rent and labor. In India, for example, rent for a rural BPO office can be less than a third of a similar office in an urban area (LiveMint 2007).

Revenue Streams

ISSPs generate revenues from the BPO services they provide (see table 7).

Table 7. Comparison of outsourcing services and educational offers provided by ISSPs

	<i>Example</i>	<i>Outsourcing services</i>	<i>Education offer</i>
Urban	Daproim Africa (Kenya)	Content moderation, data entry, online research, records management, transcription, IT services, e-learning services, etc.	<ul style="list-style-type: none"> • <i>Pre-service</i>: As part of the recruitment process, students undergo a two-week online training • <i>In-service</i>: Employees pursue higher education at various universities. During their first month of employment they undergo online training tailored for task-specific skills. After three months they receive additional soft-skills training.
	Invincible Outsourcing (South Africa)	In-bound and outbound customer services, market research, surveys, data capturing, etc.	<ul style="list-style-type: none"> • <i>Pre-service</i>: Youths undergo one-year foundation training at the Maharishi Institute. • <i>In-service</i>: Invincible Outsourcing employees pursue a university degree through distance courses offered at the Maharishi Institute. Depending on funds, selected youths additionally undergo four-months accredited call center training.
Urban and rural	Digital Divide Data (Cambodia, Lao PDR, Kenya, U.S.)	Records management, archive digitization, online research, image editing, etc.	<ul style="list-style-type: none"> • <i>Pre-service</i>: Several months of vocational training provided by partner organizations. • <i>In-service</i>: Employees can pursue higher education in a subject and at a university of their choice.
Rural	Rural Shores (India)	Digitization services, transaction processing services, testing and technical services, local language customer service, marketing campaigns, field surveys etc.	<ul style="list-style-type: none"> • <i>Pre-service</i>: Four months of training (two months foundation training in English, computer skills and soft skills, plus two months client process training), provided by subsidiary Rural Shores Skill Academy. • <i>In-service</i>: Continued training for specific task-related skills.
	iMerit (India)	Cloud and mobile IT support, virtual service desk, application testing, machine learning services, digital publishing services, online marketing, digital content management, etc.	<ul style="list-style-type: none"> • <i>Pre-service</i>: Three months of Market Aligned Skill Training provided by sister organization Anudip Foundation. • <i>In-service</i>: In-house data entry and on-the-job training on tasks that clients are not billed on. After that, continued project-aligned training, tailored to project requirements and team member skills.
	IndiVillage (India)	Image editing and processing, image and document tagging, web content moderation, data entry and verification, digitization, transcription, etc.	<ul style="list-style-type: none"> • <i>Pre-service</i>: Basic IT and soft skills training. • <i>In-service</i>: Continued professional development. • <i>Other</i>: IndiVillage invests its profits in community development, and sponsors local children's basic education.
	V Village BPO (India)	Human resources, data processing, insurance claims processes, etc.	<ul style="list-style-type: none"> • <i>Pre-service</i>: 4–6 months of training in English, Computer skills, logic, business skills, and personal development. Provided by sister organization Head Held High Foundation.

Financial Viability

Digital Divide Data generated a USD 7.8 million annual turnover in Fiscal Year 2014. Daproim's revenues were at approximately USD 270,000 in 2014. Rural Shores' revenue grew from over USD 78,000 in its first year of operation in 2008 to over USD 5.7 million in Fiscal Year 2013 (VCCircle 2014). Rural Shores' investor generated a 4.5 times return on investment when it exited its investment after four years.

Partnerships

Provision of capital: Social and private investors provide initial funding to establish the education ISSPs and BPO centers. Omidyar Network provided funding for iMerit. HDFC Ltd and Lok Capital LLC invested a total of USD 3.5 million in Rural Shores between 2009 and 2011 (Business Today 2015).

Provision of in-kind support: Non-profit organizations, technology companies and telecommunication companies support education ISSPs with IT hardware, software, and connectivity. The Datatec Educational and Technology Trust donated the technology infrastructure for the Invincible Outsourcing call center.

Assignment of work: Private companies, governments, non-profit organizations, and universities contract the education ISSPs, either directly or through other BPO service providers who sub-contract the ISSPs. Samasource, for example acts as a broker for iMerit and other ISSPs to market their services to international companies.

Outreach to social target group: Schools, universities, and non-profit organizations support the education ISSPs by marketing their programs to youth and identifying potential employees. Rural Shores, for example, asks local schools and colleges to identify suitable candidates.

Training of employees: Non-profit organizations and educational institutions develop and provide pre-service as well as in-service training to the education ISSPs employees. In Cambodia, the non-profit *Passerelles Numériques* trained youth for several months before they started work at Digital Divide Data.

Implementation: Delivering Value to the Poor

Awareness

Education ISSPs typically reach out to their target groups through their partner organizations. Digital Divide Data partners with non-profit organizations to market its program and identify eligible candidates while iMerit and V Village BPO go through their sister organi-

zations, Anudip Foundation and Head Held High Foundation. Daproim has advertised its work/study program directly through universities and student organizations, and currently focuses on word-of-mouth and social media marketing.

Acceptance

Education ISSPs design their employees' work schedule to match their study schedule. Digital Divide Data, Daproim, and Invincible Outsourcing offer their employees part-time employment. Daproim further adjusts employees' work schedules to be compatible with their university exam periods. Some companies, such as Digital Divide Data, provide career guidance and interview skills training to support their employees to find employment outside the ISSP after graduation.

While some Education ISSPs, such as Invincible Outsourcing, are directly linked to a specific education institution, others offer their employees the freedom to choose the university and course they want. Digital Divide Data's employees, for example, often enroll in a course that is unrelated to the IT or BPO sector. Those ISSPs directly linked to an education institution or training academy ensure the accreditation of their educational programs. Invincible Outsourcing's employees enroll in an accredited university degree at the ISSP's sister company Maharishi Institute. In India, Rural Shore's Skill Academy aligns the training contents with the National Occupancy Standard of each job role. iMerit's sister company Anudip Foundation provides a "Market-Aligned Skill Training" that is aligned with the framework of the National Skills Development Corporation, an Indian public-private partnership organization.

Availability

Many Education ISSPs establish their BPO centers in rural areas to make their programs available even in remote areas. V Village BPO, for example, uses a hub and spoke model where a BPO center in an urban area passes tasks on to a cluster of rural BPO centers. Daproim makes its program available to remote youths by deploying a virtual work model through which they can work from their personal computers or university computer labs.

Daproim and Invincible Outsourcing use a virtual model to provide training and higher education to their employees. Invincible Outsourcing's sister company Maharishi Institute has installed computer labs where employees can access the distance education programs of its partner universities in the United States and United Kingdom.

Affordability

Education ISSPs make vocational training affordable at low or no cost by cross-financing it through the revenues they generate from BPO services. Some ISSPs in India create subsidiary

training centers to benefit from government subsidies (see “The role of government and policy” section).

Employees are further enabled to finance university studies through the salaries they earn in the work/study programs (Digital Divide Data, Invincible Outsourcing, Daproim). At Digital Divide Data, employees are given partial scholarships to cover university fees. In Kenya, Digital Divide Data employees also receive student loans from the government. At Invincible Outsourcing, the costs of higher education degrees are additionally reduced by relying on distance courses provided by international partner universities.

Results and Cost-Effectiveness

Scale and Reach

Most education ISSPs are about five to ten years old and constitute a relatively new sector. For the time being, they operate at low scale running between one (e.g., V Village BPO) and five BPO centers (e.g., iMerit). However, older examples underline the sector’s potential for growth, reaching significant scale and operating in more than one country. Rural Shores, for example, has established 18 BPO centers in India since its inception in 2008, and currently employs about 2,600 youth. Digital Divide Data established its first three BPO centers within the first three years of operation and now runs four centers in four countries.

All the Education ISSPs analyzed target marginalized groups. At Digital Divide Data, all employees undergoing the work/study program are from low-income families. Half of them are women and about five percent have some kind of disability. Some Education ISSPs put special emphasis on employing women: at IndiVillage and iMerit about 70 percent of employees are women.

Improving Outcomes

Benefit for end users: Some education ISSPs partner with external organizations to conduct impact assessments, but the majority rely on internally collected, quantitative data to measure performance. Results suggest that youth are more likely to complete higher education, are more successful in finding employment in the formal sector, and find themselves less forced to leave their communities.

Higher education: Of Digital Divide Data’s employees, about 90 percent graduate with a post-secondary degree. Rural Shores reports that 21 percent of its employees have taken up higher education through distance learning after joining the company (India Now Business and Economy 2015). The Maharishi Institute’s attrition levels dropped 23 percent to a 10 percent rate within three months when Invincible Outsourcing started to provide students with employment and salaries.

Employment: After completing the Digital Divide Data program, 97 percent of its alumni are employed full-time. At the Rural Shores Skill Academy, over 78 percent of the 7,000 trained youth have been placed in formal sector companies, within and outside of Rural Shores (Rural Shores 2015).

Economic results: Data indicates positive impacts on the employees' income during and after their training and employment with an education ISSP. At Rural Shores, the annual household income has increased by 50 percent for about 75 percent of its employees (India Now Business and Economy 2015). After completing the Digital Divide Data program, alumni earn an average of USD 368 per month, typically three to four times the regional average. Digital Divide Data further estimates that the lifetime earnings of each program graduate increases by USD 175,000.

Rural Shores also measures the economic impact on its communities using the Local Multiplier 3 (LM3) metric developed by New Economics Foundation. This metric measures how money is spent and re-spent and the effect it has on the local economy. Rural Shores' LM3 score is 2.85, which means that for every dollar spent, an additional USD 1.85 is generated for the community (Everest Group 2014).

Migration: As several Education ISSPs operate in rural areas, rural youth are not forced to leave their communities and move to the cities for training and employment. Rural Shores report that 75 percent of its employees would have migrated to cities if they had not been employed by Rural Shores.

Scaling Up

Challenges

ISSPs face three key challenges:

- **Insufficient infrastructure:** ISSPs operating in rural areas tend to have unstable power supply and low connectivity. Some ISSPs try to lower the risks by contracting two different Internet providers and installing power back-up through generators. This, however, increases operative costs.
- **Resistance to sub-contract ISSPs:** Many ISSPs, notably smaller ones, try to partner with larger BPO providers to secure large contracts. However, most BPO providers are rather risk-averse when considering ISSPs with short track records and limited personnel.
- **Lack of managerial capacity:** There is an overall increasing demand for skilled managers, particularly in countries like Cambodia and Kenya where the IT sector is rapidly growing. This makes it harder for some ISSPs to recruit and retain skilled managers.

Furthermore, education ISSPs struggle at two levels:

- ***Attrition after pre-service training:*** Some education ISSPs have experienced high attrition of trainees after they receive their pre-service training. IndiVillage initially created an 8-month training program, but lost the majority of employees as they took their new skills to look for other jobs in the city. IndiVillage has now changed its model and provides basic pre-service training that is then complemented by comprehensive on-the-job training (William James Foundation 2015).
- ***Difficulties in combining work and study:*** Education ISSPs offering study/work formats can face problems related to employees' exam periods. For Daproim it has initially been difficult to ensure the quality of work in phases where employees are preparing for university exams.

Key Drivers

Increased demand for socially responsible outsourcing: Both the overall BPO and the Impact Sourcing Service market have grown considerably over the past years, and are predicted to continue expanding. Based on research in eight BPO service providing countries in Africa and Asia, the Everest Group estimates that the BPO market grew by nine percent between 2013 and 2014 (Everest Group 2014). The same research indicates that the Impact Sourcing Service market increased by 11 percent, comprising about 12 percent of the overall BPO industry. Further, research projects that this share will grow to 25 percent before 2023 (William Davidson Institute 2013).

Digitization and technological innovation: The growing digitization of business processes and the virtualization of the workplace is helping to expand the range of remote services that ISSPs can provide to clients. At the same time, new IT-solutions are emerging that continually improve and expand the ISSPs' modes of delivering BPO services. Technologies such as cloud computing further reduce set-up costs.

Government support: Increasing government support in the form of BPO- and ISSP-targeted policies and subsidies is lowering the ISSPs' costs for establishing centers and training personnel.

Further factors for successful scaling include partnerships with ISSP brokers to secure larger projects; lower attrition rates among ISSP employees than traditional BPO providers, resulting in lower operating costs; and obtaining quality certification for their BPO services, which enhances the acquisition of international work assignments.

Role of Government and Public Policy

Governments play a role in supporting education ISSPs in their business activities.

- **Assignment of work.** By outsourcing processes to ISSPs, governments can provide a stable source of income for the ISSPs' business and social activities. The Indian government has contracted Rural Shores for several projects, related to cattle census, land records, or e-governance.
- **Provision of IT network infrastructure.** Governments have indirectly supported ISSPs by expanding and improving the IT infrastructure, thus improving the quality and efficiency of the services provided digitally. The Indian government launched the National Optical Fiber Network project in 2013, aiming to connect over 200,000 villages with optical fiber by 2016. The Kenyan government launched the terrestrial National Optic Fiber Backbone Infrastructure Program in 2012. This program aims to provide last-mile connectivity in major towns and districts. Further, the government has developed a National ICT Master Plan 2017, according to which every citizen should be connected "through countrywide robust, accessible and affordable ICT infrastructure".
- **Promotion of BPO market development.** Governments support ISSPs by marketing their countries as BPO hubs and by creating policies that incentivize investments in the BPO industry. In its 2008 "Kenya Vision 2030," the government of Kenya declared its intention to make the country one of the top three BPO destinations in Africa. In India, the government of Tamil Nadu created the Enhanced Rural BPO Policy in 2012, by which the Information Technology Department helps rural BPOs establish units notably within educational institutions. The South African government introduced the "Business Process Outsourcing and Offshoring Investment Incentive" in 2007, through which BPOs can receive an investment grant of about USD 3,000–4,900 per seat.
- **Incentivizing youth employment.** To enhance the recruitment of notably unemployed youth, governments have created tax incentives for employers. The South African government, for example, introduced the "Employment Tax Incentive" in 2013. Under this incentive, private sector employers are granted a tax reduction if they hire workers aged 18–29 from designated special economic zones. The reduction constitutes 50 percent (up to USD 80) of the employees' monthly salary and is available for two years per employee.

Governments play a role in supporting education ISSPs in their educational activities

- **Developing and subsidizing pre-service vocational training.** To assist ISSPs in the up-skilling of their employees, some governments create support programs for pre-service training. The South African government, for example, launched the "Monyetla Work Readiness Programme" in 2007. As part of this program, the Services Sector Education and Training Authority developed a four-month vocational training schedule by which unemployed youth can earn credits for Contact Centre qualification before entering a BPO job. The BPOs select the group of participants

and commit to employ at least 70 percent of these. At the Maharishi Institute, Invincible Outsourcing’s employees undergo initial training under the “Monyetla Work Readiness Programme”.

- **Subsidizing in-service vocational training.** Governments have further created subsidies that support ISSPs in continually training their employees. As part of its “Business Process Outsourcing and Offshoring Investment Incentive”, the South African government supports company-specific training through grants of up to USD 980 per call center agent. In India, the Ministry of Labor and Employment has created the National Skill Development Corporation through which it funds non-governmental institutions that provide vocational training. As part of this program, Rural Shores’ subsidiary, the Rural Shores Skill Academy, received about USD 470,000.
- **Provision of student loans:** Governments have supported ISSPs in the higher education sector by providing selected employees with university funding. Kenya’s state corporation the Higher Education Loan Board offers Digital Divide Data’s employees student loans to finance part of their university fees.

Table 8. Social enterprises: Rapid IT upskilling

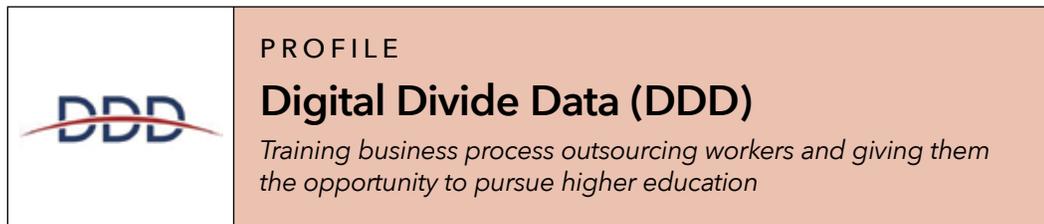
<i>Company</i>	<i>Countries</i>	<i>Description</i>
Daproim Africa	Kenya	Daproim (“Data Processing and Information Management”) provides disadvantaged university students with employment in the BPO sector to help them fund their studies. As part of its Digital Campus Connect (DCC) program, students can work part-time through a virtual work model, either in Daproim’s office, from their universities’ computer labs or from their personal computers. Additionally, Daproim provides pre-service and in-service IT training plus life-skills training on interpersonal skills, time management, career development, and personal finance. It generates revenue from BPO services (Content Moderation, Data Entry, Online Research, Records Management, and Transcription).
Digital Divide	Cambodia, Lao PDR, Kenya, United States	DDD runs socially responsible business process outsourcing centers that offer low-income youth a work/study program to pursue higher education. In this program, youth are enrolled at university while working as DDD’s data management operators (36 hours/week) and receiving partial scholarships to cover study fees. As operators they earn above minimum wages and receive social services such as health care. DDD covers operating costs through the BPO services it provides to national and international customers.
Gaza Gateway	Gaza	GGateway works with recent IT unemployed graduates, to provide them capacity building and on the job IT skills training through subcontract work with firms, thereby increasing their skill base and improving the graduates private sector employability.
iMerit	India	iMerit is a BPO service provider running IT training centers in rural India with the objective of providing employment to low-income youth and women. iMerit recruits employees who are graduates of Market Aligned Skill Training, provided by iMerit’s sister organization the Anudip Foundation. Once hired, iMerit employees undergo additional on-the-job-training before being deployed full-time on a project.

Table 8. Social enterprises: Rapid IT upskilling (continued)

<i>Company</i>	<i>Countries</i>	<i>Description</i>
IndiVillage Tech Solutions	India	IndiVillage is an Impact Sourcing Service Provider that trains and employs people from disadvantaged rural communities. Employees receive pre-service IT and soft skills training as well as continued professional development. IndiVillage further aims to contribute to the holistic development of disadvantaged these communities by reinvesting 100 percent of its profits into community improvement through education, agricultural support and craft preservation (e.g. education sponsorship for local children).
Invisible Outsourcing	South Africa	Invincible Outsourcing is a Business Process Outsourcing unit, providing primarily call center work. It offers low-income students a “Learn and Earn” program by which they work part-time as call center agents (about 4 hours per day) while pursuing higher education through the company’s sister organization, the Maharishi Institute. The partnership with the Maharishi Institute allows students to benefit from a one-year university preparation course, access to international university degrees through distance education, and a zero-interest student paid back through the salary students earn at Invincible Outsourcing. Further, students receive vocational training at Invincible Outsourcing and, depending on funds, the opportunity to obtain accredited call center agent training and certification through the Maharishi Institute’s Impact Sourcing Academy program.
Rural Shores	India	Rural Shores employs rural youth in its Impact Sourcing centers and provides them with comprehensive vocational training through the centers of its subsidiary, the Rural Shores Skill Academy Pvt Ltd. Youth receive a four-months structured pre-service training in basic English, computer skills and soft skills, followed by process-specific training on-the-job.
Samasource	Kenya, Uganda, India and Haiti	Samasource provides unemployed youth with digital skills and a direct connection to employers.
Tunapanda	Kenya	Tunapanda operates in the Kibera slums to provide 3 months intensive training in tech, design and business. The business projects Tunapanda takes on, such as multimedia editing, software and web development, helps pay for the training of new students.
V Village BPO	India	V Village BPO and its sister company Head Held High aim to provide rural youth with vocational training and employment. Head Held High provides disadvantaged youth with a 4-6-months training in English, Computer skills, logic, business skills, and personal development. They are then placed with V Village BPO where they work as BPO agents providing data processing, insurance claim processing, and human resources services.

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Challenge

Youth in Southeast Asia and the Pacific are more than five times more likely to be unemployed than adults (ILO 2013a), and youth who are employed often perform irregular work in the informal sector. Cambodians with higher education earn more than twice as much as Cambodians with a high school degree. Most high school graduates do not go on to university because they lack the financial means or they need to work to support their families (ILO 2008).

Innovation

Digital Divide Data (DDD) (www.digitaldividedata.com) provides business process outsourcing (BPO) services that aim to have a social impact. It combines employment with vocational training and financial support to offer low-income youth an affordable way to pursue higher education. The program involves three steps:

- 1) *Pre-service training*: Potential participants complete several months of technical and vocational training before being hired as operators.
- 2) *Work during probation year*: Program participants are hired for one year to work full-time as data management operators. They earn more than the minimum wages and receive benefits. They also receive in-service training to develop specific work skills and improve their English.
- 3) *Work/study program*: DDD's model enables work/study operators to enroll at university while continuing to work part time and complete a tertiary degree in four to five years. Financial support covers approximately 60–70 percent of university fees. Students cover the remaining 30–40 percent.



Impact

Since its launch in 2001, DDD has established four BPO centres in Cambodia, Lao PDR, Kenya, and the United States. Including its own staff of more than 1,300 people, the company has trained and employed more than 2,000 youth, including more than 800 who have received higher education degrees. All participants in the work/study program are from low-income families. Half of them are women, and about 5 percent have some kind of disability. About 90 percent of youth entering the program graduate with a post-secondary degree. After completing the program, 97 percent of participants find full-time employment.

Scaling Up

DDD reached breakeven in its Asian centers in 2013 and aims to reach global breakeven by 2020. The company recorded constant revenue growth: Between 2011 and 2014 annual earned revenue grew 17–47 percent a year. Both the overall BPO and impact sourcing service market are projected to continue to expand.

Constraints for expansion include: difficulty in finding skilled IT managers; tough competition with much larger BPO service providers to win international contracts; and the need for longer-term and recurring projects to ensure workers remain employed over the full duration of the work/study scheme.

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	<p>PROFILE</p> <h2>Invincible Outsourcing/ Maharishi Insitute</h2> <p><i>Providing disadvantaged students in South Africa with employment that allows them to pay for distance learning at universities</i></p>
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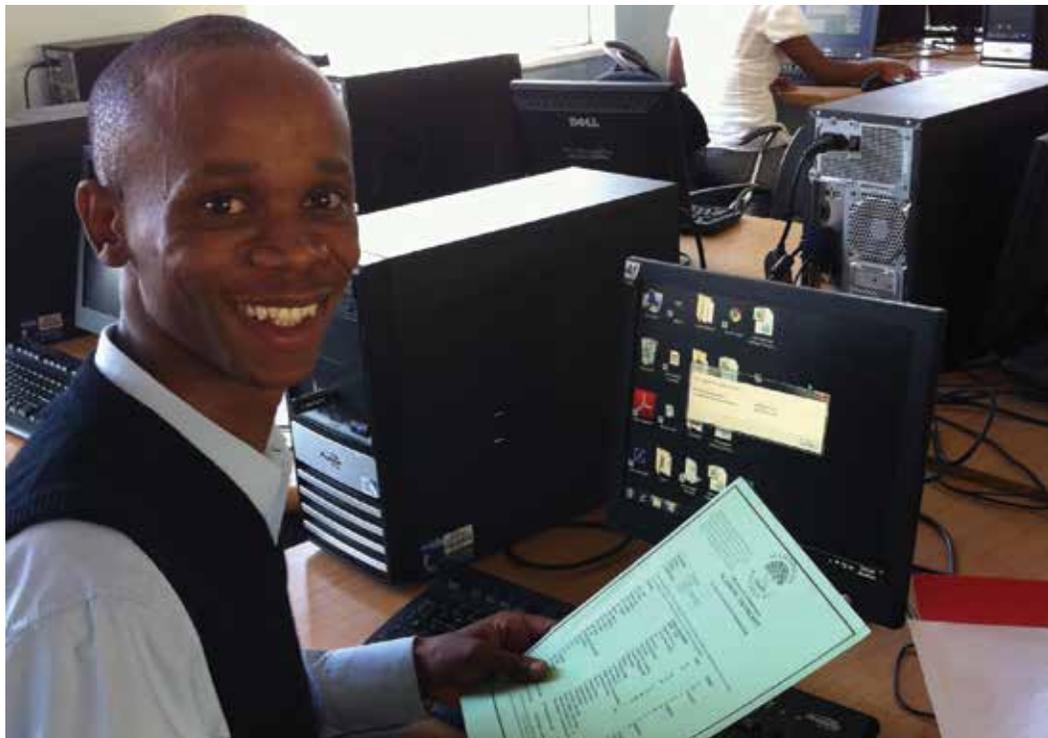
Challenge

For an upper-middle income country, South Africa has one of the lowest tertiary enrollment ratios in the world: Only about 20 percent of South Africans enroll in tertiary education, and only 15 percent of those students complete their studies, largely because they cannot afford to continue. The challenge is to increase students' ability to pay for higher education, in order to increase enrolment and graduation rates.

Innovation

For-profit Invincible Outsourcing (<http://invincibleoutsourcing.com>) is a BPO service unit that offers low-income students part-time jobs as call center agents and higher education through the company's sister organization, the Maharishi Institute. The "Learn and Earn" program features four innovations:

- 1) **Pre-service training:** Before starting their employment with Invincible Outsourcing and their studies, all students undergo a one-year foundation program at the Maharishi Institute.
- 2) **Distance education:** After the foundation program, students enroll in a two-year program that leads first to a higher diploma in business management and then to a degree in business management. The Maharishi Institute is not a higher education institution; it partners with international universities and local organizations to provide students with access to distance and contact courses.
- 3) **Sustainable education loan fund:** Students entering the Maharishi Institute are given a zero-interest loan of approximately USD 10,000 to cover their tuition. Through employment at Invincible Outsourcing, they are typically able to repay 40–65 percent



of their loans by the time they graduate. The remaining 35–60 percent is paid after graduation in monthly installments.

- 4) ***Accredited call center training:*** The Maharishi Institute occasionally offers an additional training program that provides students with 80 days of face-to-face training, of which 160 hours are workplace experience at Invincible Outsourcing or one of the Maharishi Institute’s business partners.

Impact

Invincible Outsourcing employs about 300 Maharishi Institute students. Since its launch in 2009, about 600 students have participated in the program. All students have found employment after graduation. About 80 percent are employed by the time of their graduation; the remaining 20 percent are employed within six months of graduation, according to the company. Ninety percent of students find employment through the Maharishi Institute’s career support and business partnerships.

Scaling Up

The South African government has adopted several policies and initiated several programs to facilitate the BPO market, particularly the call center segment. The Institute is considering creating a “university in a box” franchise model, but doing so has proven difficult because

the Institute does not have the legal rights to share the educational contents provided by its partner universities.

Invincible Outsourcing broke even in 2013. Almost all of its revenue comes from its business activities. It relies heavily on relationships with the Maharishi Institute's business partners, however, which often fail to provide enough candidates. Additional marketing is needed to ensure that Invincible Outsourcing operates at its full capacity. Invincible Outsourcing's sustainability is limited by the Maharishi Institute's financial model. The Institute operates as a non-profit organization and depends almost entirely on donor funding and subsidies. The Institute is exploring options for becoming less donor-reliant, such as building long-term partnerships with corporations that could move their call centers to Invincible Outsourcing.



Making Tertiary Education Possible for Low-Income Students

Innovative finance mechanisms by non-bank financial institutions are opening the doors of institutions of higher learning

HIGHLIGHTS

- Non-banking financial institutions assess risk based on their assessment of potential borrowers' employability and future incomes rather than their households' assets or incomes.
- Students pay back a percentage of the income they earn, reducing the risk of taking on debt as they do not need to repay the loan if they fail to find work.
- To enhance students' employability, some models provide career guidance, training, and job placement opportunities.



Summary

Millions of low-income students are unable to attend universities and vocational training institutes after finishing high school because they cannot afford the tuition. Innovation financing programs from non-banking financial institutions—including schemes in which borrowers repay the loans with a share of their future income—are making higher education possible for some of these students.

Development Challenge

Millions of low-income students would like to receive higher education but are unable to do so because they cannot afford it. Many public lending schemes suffer from high default

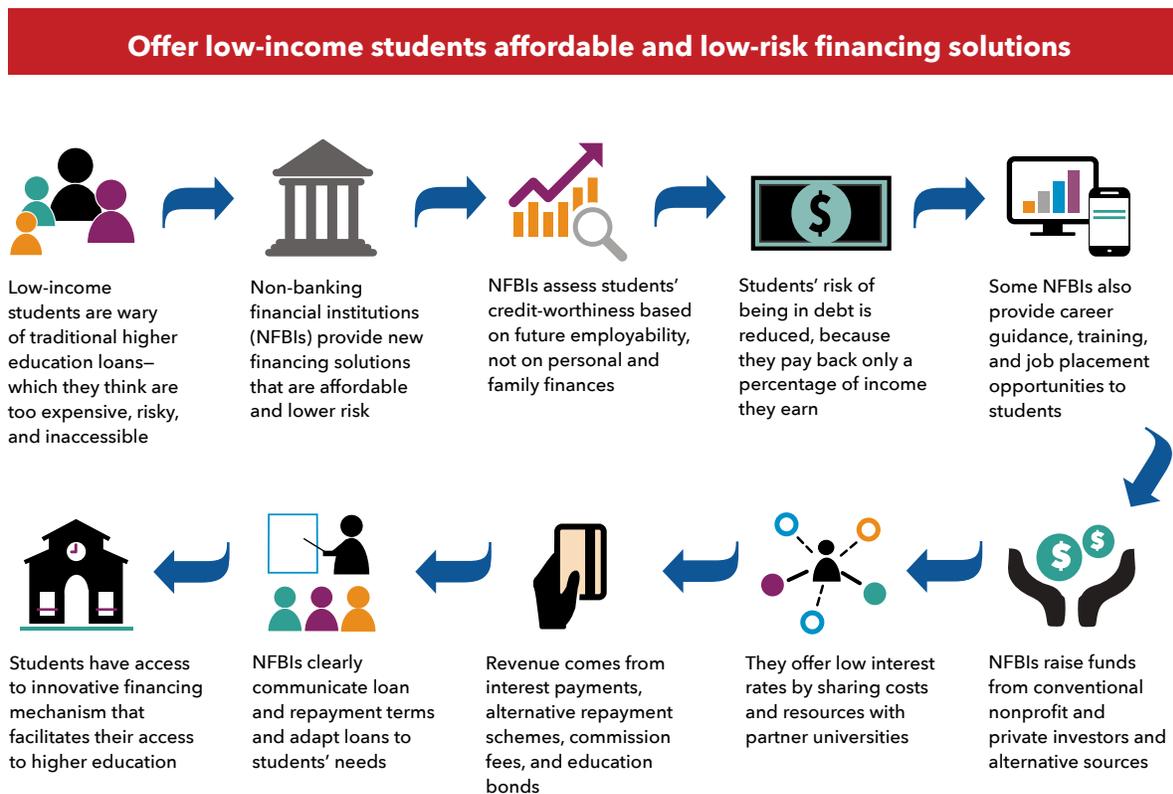
rates and administrative costs (Salmi 2003). Moreover, most students from low-income households do not qualify for such loans—and among those who do, many decide not to borrow, because interest rates are too high and they fear falling deep into debt if their future income is insufficient to repay the loans. The challenge is to develop a better way to finance higher education for low-income students.

Business Model

Non-bank financial institutions are providing new financing solutions that are designed to be accessible, affordable, and low risk for low-income students. These lenders raise funds from conventional investors, such as investment funds or development agencies, supplementing them with capital from alternative sources, including crowd-sourcing. They keep interest rates low by minimizing operational costs and partnering with universities. To reduce the risk of default, they provide career guidance, training, and job placement opportunities to students.

Components of the Model

Figure 5. Features of the student financing model



Cost Factors

The key cost factor is the establishment of a fund to generate the loans, and this will normally require attracting impact investor capital. Online platforms and mobile money apps are another investment needed to reduce costs and facilitate loan applications, control student loan expenditures, and facilitate payment. Another key cost is the setting up of partnership agreements with higher education institutions, which can help facilitate intake of applicants.

Revenue Streams

Models generate revenue from loan repayment and other sources (table 9). Many charge interest rates. Others (such as Fundación Ventanas, Lumni, and UpSkill Capital) charge a fixed percentage of students' future income instead of interest. Many models generate additional revenue from fund administration and performance-based fees charged to investors or commission fees to partnering universities. Eduloan, FINAE, and Ideal Invest issue education bonds on capital markets, generating revenues from the loans before they fall due.

Table 9. Revenue sources and financial models of selected non-traditional educational lenders

<i>Enterprise/Country</i>	<i>Sources of revenue</i>	<i>Revenue model</i>
Eduloan (South Africa)	<ul style="list-style-type: none"> • Interest payments • Percentage of tuition • Bonds sold on capital market 	Students pay fixed interest rates of 1 percentage point above national prime rate, with monthly repayments over a period of 6–24 months. Educational bonds are sold at market rates to socially responsible investors to generate additional capital.
FINAE (Mexico)	<ul style="list-style-type: none"> • Interest payments • Bonds sold on capital market 	Students pay annual interest of 15–17 percent, through monthly payments over a period of three times the duration of studies. Education bonds are sold on the Mexican capital market to generate additional capital.
Ideal Invest (Brazil)	<ul style="list-style-type: none"> • Interest payments • Bonds sold on capital market • Performance fee • Commission 	Partnering universities pay a commission equivalent to a percentage of the loans issued to their students and (partly or fully) cover the students' interest payments. Students avoid paying a large upfront tuition fee, but instead pay a more affordable monthly fee at no interest.
Lumni (Latin America and United States)	<ul style="list-style-type: none"> • Fund management fee • Bonus fee 	Investors pay Lumni an individually agreed upon management fee, which is a percentage of the invested assets (typically about 2.5 percent). Lumni also charges investors a bonus fee if the real financial return is higher than the promised return. Students payback a fixed percent of their paycheck for a set period of time.

Table 9. Revenue sources and financial models of selected non-traditional educational lenders (continued)

<i>Enterprise/Country</i>	<i>Sources of revenue</i>	<i>Revenue model</i>
Fundación Ventanas (Colombia)	<ul style="list-style-type: none"> • Share of students' income 	Students pay 10-15 percent of their future income after graduation over a period of time negotiated with each borrow.
UpSkill Capital (India)	<ul style="list-style-type: none"> • Share of students' income • Placement fee 	After students graduate, UpSkill places them with employers, who pay a placement fee. During their six-month paid internships with these employers, students pay an average of 22.5 percent of their income to Upskill to repay tuition costs.
Trustco Finance (Namibia)	<ul style="list-style-type: none"> • Interest payments 	Students pay interest rates of about twice the national prime lending rate. Repayment is over a period of 12-60 months (average is 29 months).

Note: Table includes revenues generated from business activities only. Some enterprises also receive donations, grants, and subsidies.

Financial Viability

Results are sparse, but some suggest that models can break even and even earn profits. FINAE reached breakeven in 2012, six years after its inception. Lumni's subsidiary in Colombia broke even in 2013, seven years after it was established. Lumni's investors have returns on investment of about 9 percent. In 2008, 12 years after its foundation, Eduloan offered its stakeholders a 30 percent return on invested capital (IFC 2008).

Partnerships

Partnerships are key to the success of non-banking financial institutions in the student finance sector. Private investors, microfinance institutions, investment funds, and development agencies provide funding to establish the funds and increase broaden loan/investment portfolios. Development banks and agencies can support the lenders by providing credit guarantees, as the Agence Française de Développement does for Eduloan.

Educational institutions help lenders keep operating expenses low, by providing infrastructure and personnel. Some of them cover some interest payments. Others reduce tuition slightly. FINAE's university partners are required to establish first-loss collateral funds that compensate for borrowers' repayment defaults. Some institutions provide access to contacts within target communities. Trustco Finance, for example, piggybacks on its partners' mobile offices to promote its loan schemes. Other institutions support lenders by designing and conducting impact assessments.

Unlike traditional financing schemes, some models focus on private universities, not just nonprofit or public institutions. Graduating from a private university may increase employability, which increases graduates' ability to repay their loans.

Not-for-profit organizations support some lenders by providing nonfinancial support, such as legal advice on contract design or marketing assistance. Some, like Fundación Ventanas and Lumni partner with private sector companies, which interview graduates for jobs, while others such as Upskill, matches internships with private companies.

Implementation: Delivering Value to the Poor

Awareness

Most models leverage their partners' customer bases and infrastructure to market their products. Eduloan, for example, has representatives and offices on the campuses of partnering universities; FINAE outsources marketing to partnering institutions. The company also conducts school visits to promote the schemes to high school students. Ideal Invest runs a call center that contacts interested borrowers upon request via SMS.

Acceptance

Clear and simple communication of loan and repayment terms ensures that they are easily understood. Loans are adapted to low-income students' needs, in some cases through individualized repayment terms. The repayment period and the share of income repaid in Lumni's income share agreements are tailored to each student and investor. Basing repayments on actual future income reduces the risk of default or prolonged indebtedness as result of low wages or unemployment.

Availability

Quick procedures make enrolment easy. Trustco Finance reaches out to remote students through door-to-door visits by salespeople using handheld devices that can immediately assess their creditworthiness and preapprove loans.

Models offer consultations and borrower support through partner institutions, representatives, and mobile offices. Students often access services and apply for financing through lenders' websites, online forms, or online crowd-funding platforms, such as Milaap. Financing is disbursed either to the student (via bank or mobile money transfer) or directly to the universities. Eduloan issues borrowers electronic cards that they can use only at selected places, such as bookstores and specific student accommodation providers. It accepts repayments through a mobile payment system.

Affordability

Non-bank financial institutions offer lower interest rates than traditional lenders. Eduloan charges just 1 percent more than the prime rate. Ideal Invest offers short-term loans with a zero-interest scheme for students, with the education facility absorbing the interest payments. FINAE's partner universities establish first-loss collateral funds. Income share agreement models, such as Fundación Ventanas, Lumni, and UpSkill, increase affordability by allowing borrowers to pay a percentage of their income after graduation rather than a fixed interest rate.

Results and Cost-Effectiveness

Scale and Reach

Ideal Invest has reached more than 80,000 students since 2001, Trustco Finance disbursed more than 55,000 loans between 2005 and 2011, and Eduloan provides loans to 50,000–80,000 students a year.

Models reach out to students from diverse income groups but focus on students from low-income households and/or rural areas. At Lumni's Colombian fund, 88 percent of students are the first in their families to attend university. About 78 percent of Trustco Finance's loans are to students from rural areas. In contrast, 47 percent of FINAE's borrowers are from middle-income families (19 percent are from low-income backgrounds).

Improving Outcomes

Many models conduct impact evaluations, based on the number of beneficiaries, the number of disbursed loans, enrolment, and retention rates. Most evaluations are internal. Some models, such as FINAE and Lumni, use auditing firms, universities, or research institutes to evaluate their results.

Initial results seem to be positive. An external study on Eduloan in South Africa found that between 2004 and 2007, access to an education loan increased the probability of enrollment by 23 percentage points, and the number of academic credits completed by its borrowers increased by about 40 percent (Gurgand, Lorenceai, and Mélonio 2011). About 30 percent of FINAE students drop out of university, fewer than the Mexican average of 38 percent (IDB 2013). In 2011, 95 percent of Fundación Ventanas students graduated, compared with the Colombian average of 45 percent (World Bank and OECD 2012). FINAE estimates that it generates a social return on investment of about USD 3 for every dollar invested. Lumni claims that the projected annual income of participating students increases by 50–300 percent.

Cost-Effectiveness

Non-bank financial institutions achieve cost-effectiveness by lowering administrative overhead, reducing default rates, and leveraging partnerships to keep costs low. Models that schedule repayments as a percentage of income rather than fixed monthly fees reduce defaults. Negotiating slightly discounted tuition with universities lowers costs for students.

Scaling Up

Challenges

Establishing education financing funds requires substantial initial and ongoing funding: Student loans are a long-term investment that takes years before generating a substantial stream of income, particularly in low-income settings, where schemes need to be designed as long-term small repayments to be affordable for students. Institutions whose revenues depend mainly on low interest rates need to have large portfolios to be able to cover their operating costs.

Demand for higher education and investor interest are growing. In 2012, 32 percent of secondary school graduates were enrolled in tertiary education, up from 20 percent in 2001 (World Development Indicators n.d.). Over the same period, the ratio increased 81 percent in East Asia and the Pacific and 78 percent in Latin America. In 2013, social impact investments in education totaled USD 3 billion (D. Capital Partners 2013).

Three factors determine the ability to reach scale:

- ***Establishing cost-efficient mechanisms for disbursement and collection of payments:*** Some enterprises pay tuition directly to students' universities. Eduloan gives students debit cards that can be used for various types of expenses and allows students to repay their loans using mobile phones. Lumni works with employers to automatically deduct repayments from borrowers' paychecks.
- ***Forging close partnerships with higher education institutions:*** Successful models turn partner universities into their main promoters. Universities are often the first point for potential students to learn about financing options.
- ***Reducing risk for lenders and investors:*** Institutions share risks with partners. Eduloan and FINAE have their loans guaranteed by third parties. IDEAL Invest "outsources" the risks by setting up special purpose vehicles that purchase the assets and issue them on capital markets.

Role of Government and Public Policy

Government involvement in these models has been limited. The South African government promotes Eduloan among its agencies and schools, and it enables direct payroll deduction

of loans provided to civil servants. The South African Micro Finance Regulatory Council supports the development of lending regulations and the microfinancing industry in general.

Table 10. Social enterprises: Non-bank financial institutions providing student loans

<i>Enterprise</i>	<i>Countries</i>	<i>Description</i>
Eduloan	South Africa	Provides education loans targeted primarily at civil servants who wish to upgrade their qualifications and increase their salaries. Loans cover tuition, educational materials, accommodation, and food. They are repaid through automated monthly payroll deductions. Eduloan generates additional capital through an educational debenture bond sold in the capital market.
FINAE	Mexico	Finances full tuition costs, at rate of 15-17 percent interest a year. Students repay loans with fixed monthly payments over a period equivalent to two to three times the duration of their studies. Universities establish first-loss collateral funds. Company generates revenue from selling educational bonds on the Mexican capital market.
Fundación Ventanas	Colombia	Social investment fund provides academically promising students with interest-free financing and comprehensive mentorship program. Program based on profit and loss-sharing relationship between borrowers and investors in which students pay investors a set percentage of their future income for a given number of years.
Ideal Invest	Brazil	Finances educations through successive small loans. Once a student is approved to borrow, Ideal issues initial loan covering part of first semester. Each subsequent loan covers another semester's tuition. All loans are repayable in 12 months. Repayment is coordinated and staggered, so that only one installment is due each month.
Kiva	Global	Online crowdfunding platform connects lenders with borrowers from a variety of sectors, including (since 2010) higher education. Lenders select borrowers based on their online profile and disburse the loan capital (of USD 25 or more) to Kiva. Kiva passes the full amount on to borrowers through its network of field partners, microfinance institutions, and nonprofit organizations, who identify borrowers and manage the loans.
Lumni	Chile, Colombia, Mexico, Peru, United States	Promising students receive financing in return for an agreed percentage of their future income for a given number of years. Company creates and administers funds for investors (companies, universities, individuals) and manages student tracking, payment collection, and follow-up.
Milaap	India	Online crowd-sourcing platform enables individuals to lend to low-income Indians to provide them with access to education, clean water, energy, and other services. Loans go to prequalified individuals and small businesses through network of community partners that specialize in providing and managing microloans. Job-linked training for youth provides rural people in the informal sector with skills. Loans also help meet infrastructure needs of schools serving poor families.

Table 10. Social enterprises: Non-bank financial institutions providing student loans (continued)

Enterprise	Countries	Description
Trustco Finance	Namibia	Part of Trustco Holding Group, which owns the Institute for Open Learning, which provides higher education through distance learning. Provides educational loans to students enrolled at the institutes, predominantly teachers, who live in rural areas and take classes online.
UpSkill Capital	India	Finances technical and vocational training. Students repay a portion of their salary when they enter paid six-month internships after completing their training.

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	<p>PROFILE</p> <p>Lumni</p> <p><i>Providing funding and career support to promising students in Latin America and the United States who agree to pay back a percentage of their future income</i></p>
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Challenge

Low-income students are underrepresented in tertiary education. A major obstacle is lack of financing for tuition and related costs. Government lending programs are inadequate—and even where such loans are available the terms are usually unattractive, because low-income students are classified as high-risk borrowers.

Innovation

For-profit Lumni (www.lumni.net) has developed model based on “income share agreements.” Promising students receive financing from Lumni in return for an agreed percentage of their future income. Various types of investors provide the funds in expectation of earning profits. The approach has three key features:

- 1) **Shared risk:** Investors share the students’ risks, losses, and profits. Because they lose if graduates are unemployed or poorly paid, investors want to ensure that students find well-paid employment.
- 2) **Non-financial support:** To enhance the success of students and investors, Lumni provides seminars, an online learning platform, career coaching, and job placement throughout students’ contracts.
- 3) **Fund management:** Lumni manages the relationship between investors and students. It designs and runs social investment funds for corporations, private investors, and nonprofit organizations. Each contract is tailored to a specific student’s case. The percentage of income to be shared ranges from 10–18 percent, and the payment period is typically 2–2.5 years per year financed.



Investors earn income from students' payments. Lumni generates revenue from two types of fees it charges investors: a management fee, typically about 2.5 percent of assets under management, and a bonus fee, which it earns if the actual financial return is higher than the expected return committed to investors.

Impact

The company served nearly 1,000 students in 2009, about 5,000 in 2014, and more than 7,000 in 2015. Students come from a range of economic backgrounds, cities, and family backgrounds. In Colombia, virtually all students funded belong to the bottom three income groups, and 88 percent are the first generation in their families to attend university. Drop-out rates are just 2 percent.

Scaling Up

Lumni has subsidiaries in five countries (Mexico, Chile, Colombia, Peru, and the United States), where it manages 33 funds (11 investment funds and 22 corporate funds). Large investments from donors and investors have enabled Lumni to grow its portfolio quickly. Its assets under management more than tripled between 2012 and 2014, to about USD 35 million. Reaching large scale has been key to generating sufficient revenue to break even. In 2014, the company broke even in Colombia, after reaching about 4,300 students. It expects

to break even in all countries in 2016. To date annual returns have averaged more than 9 percent. The payment default rate is extremely low, at about 0.9 percent (Lorin 2014).

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	<p>PROFILE</p> <p>FINAE</p> <p><i>Enabling low- and middle-income Mexican students to attend private universities through affordable payment plans</i></p>
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Challenge

Tertiary enrollment in Mexico soared between 2002 and 2012. Public universities can accommodate only a fraction of applicants, forcing most students to attend private institutions. The USD 1,500–15,000 annual tuition these universities charge puts them out of reach of the 70 percent of applicants who come from families earning less than USD 3,000 a year. The challenge is to make tertiary education affordable for them.

Innovation

For-profit company FINAE (<http://www.finae.com/>) lends students money for tuition, which they repay in fixed monthly payments over a period equivalent to two to three times the duration of the studies. The payments include implicit interest payments of about 15–17 percent. The company works with a dozen high-quality private universities at which the ratio between tuition and expected income after graduation is high, thereby increasing the likelihood that its students will pay back their loans. As a result, its default rate is about 8 percent, according to the company.

FINAE's model is based on key strategies:

- **Fixed payments, whether or not tuition goes up:** FINAE fixes payment rates at the beginning of the contract. To compensate for fluctuations, it takes them into account in drafting the payment plans.
- **Risk and cost sharing with universities:** FINAE partners with universities to share costs and risks associated with financing loans. Universities absorb the marketing and infrastructure costs necessary to promote the program and fund a First Loss



Collateral Fund in case a student defaults on his or her loan. Low operating costs, and risk-sharing with university partners permits FINAE to remain sustainable and profitable while providing students affordable interest rates (approximately 15 to 17 percent).

- ***Additional revenue:*** To generate revenue before the payment plans reach maturity, FINAE creates education bonds, which it sells on the Mexican capital market.

Impact

Since its launch in 2006, FINAE has served more than 7,200 students, including 19 percent from low-income families and 47 percent from middle-income families. About 70 percent of students are the first in their families to pursue higher education. FINAE increased lending from USD 2.2 million in 2010 to USD 25 million in 2015. It fully covers its operating costs of approximately USD 4 million a year. In 2013, HR Ratings rated FINAE's education bonds AAA. According to a social return on investment analysis conducted by the Dutch consulting firm SHAERPA, FINAE generates a social return of USD 3.16 per USD 1 invested.

Scaling Up

FINAE currently partners with 10 universities in 24 states, totaling 87 campuses and more than 20 percent of total private enrolment in Mexico. The demand for private tertiary education is expected to remain strong, boding well for prospects for expansion. However, FINAE's growth may be constrained by skepticism in Mexico toward borrowing and the moderately high dropout rate (approximately 30 percent). To address the latter problem, the company is trying to identify at-risk students early enough to orient them toward appropriate careers to keep them enrolled.

SECTORAL BUSINESS MODELS

HEALTH



Reaching the Poor through Community Health Workers

Local women provide basic healthcare services, including information and referrals, through home visits and kiosks

HIGHLIGHTS

- Community health workers bring affordable health-related goods and services to the homes of people in underserved communities with poor access to basic health services.
- Programs reduce morbidity and mortality and increase the utilization of health services.
- Most rely on donor funding



Summary

Community health workers (CHWs)—largely local women, provided with only basic training—are providing health information, reminders, and basic healthcare services; selling health-related products, including medicines; and collecting valuable healthcare data. By going door to door to reach people, they are improving health outcomes among the rural poor, who are often unable to reach healthcare facilities.

Development Challenge

Accessing basic health services is difficult in rural and poor communities, in part because of the shortage of skilled professionals. Even where services are provided free of charge, poor people often fail to access them, because they lack the means to reach the facilities.

The result is poor health and nutrition outcomes and high morbidity and mortality from preventable causes.

Business Model

CHW programs address a number of key challenges that health systems in developing countries face, including an acute shortage of professional health workers, health workers' unwillingness to spend extended time in remote and rural areas, and the inability of most formal health sector institutions to reach the poorest people within those communities. Robust evidence indicates that CHWs lead to improved health outcomes, particularly in maternal and child health (WHO 2007).

There is no universally accepted definition of CHWs; their roles, profiles, and titles vary across and within countries, where they are known by some 40 different terms. The plethora of terms reflects the diverse roles these people play, from promoting healthy practices to providing specialist services and selling health and sanitary products.

Because they live in the communities they serve, CHWs are culturally aware and able to deliver key health messages in ways that recognize the local cultural context. They help other community members navigate the formal health system, providing a crucial link between people and facilities.

Components of the Model

CHWs are people from the community with some education who receive brief training (see figure 1). Although they can include men, most are women. Arogya, an Indian enterprise, recruits only young women with secondary education. The Real Medicine Foundation, which also works in India, places emphasis on local, rather than formal, knowledge.

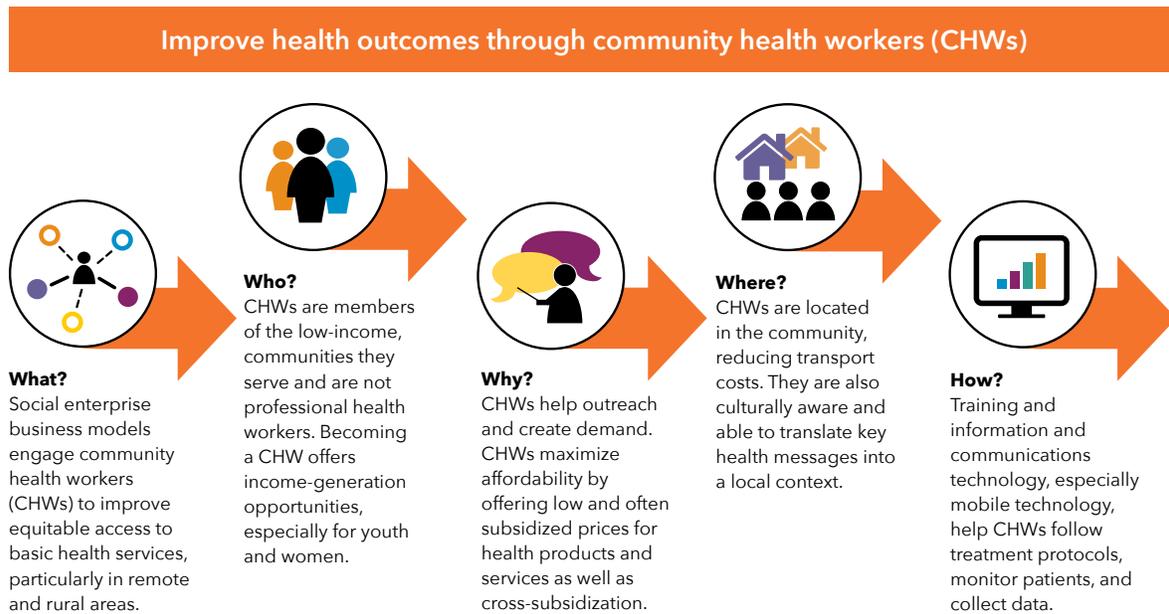
CHWs educate people in underserved communities, link them to formal health services, and generate demand for health services. They sometimes also collect health information; sell health products and other goods; offer simple preventive, diagnostic, and treatment services; facilitate adherence to treatment; support family planning; refer patients to health centers; and handle recordkeeping.

CHWs receive salaries, stipends, or results-based payments or fees. They are also motivated by nonfinancial incentives, including mobile phones, free or preferential access to commodities, social interaction with peers, help transitioning into national health service or work with an NGO, and priority for paid jobs in health campaigns such as immunization days.

Social enterprises such as Living Goods and M-Afya in Africa link offer income-generation opportunities through the sale of commodities. In addition to providing health education, its workers sell health-related products (such as mosquito nets and water purification tablets); personal care products (such as soap and sanitary pads); and products that support household income or savings (such as solar lanterns and high-yield seeds).

Staff at local health facilities often supervise, mentor, and motivate CHWs, who refer patients to them. M-Afya gives local clinicians ownership stakes in kiosks the enterprise

Figure 6. Features of model that empowers community health workers for access to healthcare services



operates. Arogya partners with the Fortis Hospital chain, which co-develops the training of CHWs, provides pro bono consultations, and reviews the services provided by its physicians. It also partners with local health facilities of the public sector, which accept referrals from and provide medical advice to its CHWs.

Mobile technology plays an important role in empowering CHWs. It facilitates patient monitoring, allows for the application of computerized treatment protocols, supports the collection and analysis of patient data, enables the sharing of patient data with health facilities, promotes results transparency and performance management, and reduces costs.

CommCare, which operates in India and other countries, provides its workers with software that includes registration forms, checklists, danger sign monitoring tools, and educational prompts. The Real Medicine Foundation uses CHWs to combat malnutrition. It equips every worker with a mobile phone to help triage children, record their information, assist in their counseling sessions with images and voice prompts, and send reminders for follow-up. Use of the mobile phone improved both the quality of the data and interactions with beneficiaries.

Cost Factors

Key cost factors are development of the information and communications technology (ICT) software, hardware costs and training of CHWs. Salaries for CHWs are generally based on their revenue generation activities rather than a fixed amount.

Revenue Streams

Revenue streams include payment for referrals, the sale of products and services, and grants. Living Goods' "micro-entrepreneurs" sell health-related goods, such as antibacterial soap and medicines, to people that lack access to markets. Arogya's CHWs charge a small fee at kiosks for distance consultations with doctors, who consult patients via a mobile connection and laptop computer. CHWs sometimes charge a small fee to the users.

Financial Viability

Both for-profit and nonprofit enterprises use CHWs. Merrygold is a profitable for-profit enterprise. Living Goods' micro-franchisees are financially viable and the organization is highly cost-effective (at a net cost of less than USD 2 per client per year), but it still relies on grant funding of approximately USD 10 million to cover its annual budget. Arogya aims to achieve financial sustainability by generating revenue from selling the aggregated data it collects and analyzes. Other initiatives, such as the Bandhan Health Program and SAJIDA Bandhu, use revenue from microfinance loans to cross-subsidize health programs. Living Goods recruits workers from the BRAC borrower base, and BRAC branches double as depots and field offices.

Partnerships

Social enterprises, NGOs, and microfinance institutions frequently pilot and develop the business model, recruit and train CHWs, source and provide commodities, and collaborate with partners in developing technology. Embedding the program within a microfinance organization has provided synergies that facilitate recruitment, awareness-raising, business model development, and cross-subsidization. The Sajida Foundation, a microfinance organization in Bangladesh, provides health insurance to all of its borrowers. It has created a network of CHWs to bring healthcare services directly to them or refer them to one of Sajida's hospital or care networks.

Partners from the public or private sector provide ICT. Click Diagnostics, a global mobile health enterprise, facilitates technology and connectivity for SAJIDA Bandhu. The Birla Institute of Technology and Science supports the development of training modules for Arogya. Fortis Hospitals provides medical input into the development of computerized treatment protocols that are loaded onto mobile platforms and used by CHWs.

Implementation: Delivering Value to the Poor

Awareness

CHWs create awareness through health education and promotion and the creation of demand for specific health services. They have played a crucial role in building demand for reproductive health services in rural India, helping the Merrygold network expand, for example.

Acceptance

The model aims to maximize community acceptance in a number of ways. Arogya workers receive communication training that emphasizes the use of the local vernacular. It uses the term *panna* (named after a 16th century inspirational nursemaid) rather than health worker, which it believes lacks dignity. It uses television series and Bollywood films to impart patient-communication skills to *pannas*. Arogya also increases acceptance by hiring young people, who need the work.

Following its realization that communities accept CHWs only if they perceive them to deliver immediate benefit, Arogya adapted its approach to offer vision and hearing tests. Some models (such as CommCare) design software applications to be adaptable to different contexts and operated through locally available, inexpensive, Java-enabled phones as well as Android smartphones (WHO 2013).

Accessibility

By coming to where people live, including their homes, CHWs overcome the challenges and barriers faced by communities in accessing care. Living Goods' health entrepreneurs, Arogya's *pannas*, SAJIDA's *sajida bandhus*, and Bandhan Health's health volunteers all provide door-to-door services. M-Afya provides care through kiosks. The Real Medicine Foundation's community nutrition educators (CNEs) link families to services they are either underutilizing or unaware of, while providing service providers with inputs.

Affordability

Services are usually free or subsidized. Arogya facilitates access to free medicine (using the government of India's free medicine database) to help poor patients save on prescription drug costs (Sustainable Innovations n.d.). Living Goods cuts out unnecessary layers of resellers and harnesses the buying power of a network of 1,200 health entrepreneurs to increase availability and decrease the price of high-impact products, according to the enterprise. M-Afya kiosks use the M-Pesa mobile money system for client payments, reducing banking costs.

Results and Cost-Effectiveness

Scale and Reach

CommCare, which operates in India and South Africa, engages thousands of CHWs, serving up to one million beneficiaries. Living Goods reports that it has supported 154,000 pregnancies, treated 564,000 children for potentially deadly diseases, and sold more than 58,000 clean-burning cook stoves since 2007. M-Afya kiosks served 2,500 clients (almost 300 per kiosk) between September 2013 and March 2014 (Health Enterprise Fund n.d.). Bandhan Health Program reports having almost 600,000 beneficiaries.

Improving Outcomes

Robust evidence indicates that CHWs can contribute to improved health outcomes. A randomized controlled trial evaluation found that Living Goods reduced mortality among children under five by 25 percent and increased the likelihood of home visits in the first seven days after delivery by 72 percent (Björkmann-Nyqvist, Svensson and Yanagizawa-Drott 2013). Automated SMS reminders from Living Goods to parents of sick children and pregnant women have increased healthy pregnancy practices and visits to doctors, according to the company.

A Cochrane review* of 132 randomized control trials from around the world shows that CHW programs increased immunization uptake, proper breastfeeding practices, and care-seeking for childhood illnesses; increased tuberculosis cure rates; and reduced child morbidity and mortality (Lewin and others 2010).

CHWs facilitate individuals' navigation through the health system, leading to better decision-making about when to invest time and money on consulting a health professional. CommCare increased the retention of health-related knowledge among CHWs and helped them keep up with scheduled visits (Kumar 2012). A validation exercise conducted by Mashavu (A social enterprise, Mashavu works with CHWs to track village-level health) in Kenya showed that CHWs made the correct decision about whether a patient should see a doctor 87 percent of the time.

Initiatives can also reduce prices. The arrival of Living Goods in Kenya and Uganda forced private pharmacies to improve the quality and reduce the prices of their offerings. After Living Goods entered a market, the price of antimalarial drugs fell by 18 percent, there was a 20 percent reduction in counterfeit drug sales, and use of antimalarial medicine rose 39 percent (Björkmann-Nyqvist 2013).

CHWs collect data that are often shared with other public health stakeholders. These data improve health management and planning. Health facilities in India, for example, used data generated by Arogya's CHWs to meet their monthly reporting obligations and provide early warnings about health epidemics.

* Cochrane Reviews are systematic reviews of primary research in human health care and health policy, and are internationally recognized as the highest standard in evidence-based health care resources

Cost-Effectiveness

Standardization and separability are instrumental to making the model a cost-effective alternative (Castano 2014). Standardization allows tasks to be shifted from higher-qualified human professionals (such as doctors and nurses) to CHWs with little formal training. Medical conditions for which diagnosis and treatment are highly standardized, such as diarrhea and malaria, lend themselves to being delegated to CHWs. Separability means that a task can be performed without equipment and supplies, allowing services to provide at home.

Although the public health system provides many goods and services for free, poor people are still often unable to afford them, because they cannot afford the time and money cost of reaching the facility. Providing services at home brings services to people who might not otherwise have been able to access them.

Scaling Up

Challenges

CHW programs work best when they make good use of ICT. ICT is also important to donors, who prioritize funding to technology components. Using ICT requires infrastructure, mobile connectivity, and skilled staff (both to troubleshoot and repair devices and analyze data), however, not all of which are available in poor communities.

Alignment with the national health system is also important. Arogya initially faced problems getting buy-in from local public health facilities, whose staff perceived it as a competitive threat. It found that sharing the data its workers collected with local health facilities was an important incentive to local health staff to collaborate.

Business models that ensure profitability for CHWs as well as the social enterprise or microfinance institutions are still evolving. Arogya found that its CHWs earned too little to maintain a reasonable standard of living. It therefore decided to share income from the sale of data with them to top up their monthly income.

The CHW model is effective in dealing with simple medical issues. It is not appropriate for complex, experience-based diagnosis and tailored treatment or services that require specialized medical equipment and facilities. The model also depends on a health system that can absorb the increased demand generated through health promotion and referrals.

Role of Government and Public Policy

Governments have been working with CHWs for decades, setting up and running major schemes. Market-based approaches can thus rely on a wealth of experience and evidence about success factors.

Links between CHWs and higher levels of the health system are key. In Uganda, Living Goods works closely with district health teams, which are engaged in recruiting and inter-

Table 11. Social enterprises: CHW initiatives

<i>Enterprise</i>	<i>Description</i>	<i>Business model</i>
Arogya Triage@ Home (India)	<p>Delivers maternal and child health care services door to door at extremely low cost. Community health workers use health data repository and electronic medical records</p> <p>Reach: Started with 15 villages, covering 45,000 people</p>	<ul style="list-style-type: none"> • CHWs charge consultation fee and, as entrepreneurs, are free to offer additional services • Revenue creation through sale of data collected by CHWs and processed through mobile systems (revenue to be shared with CHWs) • Use of data to build predictable revenue streams for CHW • Facilitates public sector facilities' work by doing reports on their behalf • Primary CHW function: Health educator, data collector; service provider • Incentives: Financial: Revenue; Non-financial: Training (medical, business, communication) • ICT: Computerized treatment protocols for common ailments and preventable diseases loaded onto mobile platform (tablet or laptop) equipped with diagnostic devices (camera, blood pressure meter, etc.); creating an electronic medical record for every individual; relayed to local health facilities for diagnosis and treatment advice to be distributed via text message to CHWs
Bandhan Health Program (India)	<p>Creates health awareness among mothers and adolescent girls, ensures accessibility to health services, reduces health expenditures of poor families, and develops health microentrepreneurs.</p> <p>Reach: 17,200 health forum participants, 592,000 beneficiaries (cumulative)</p>	<ul style="list-style-type: none"> • Cross-subsidization of health program through microfinance revenues • CHWs provide health education and distribute health kits • Primary CHW function: Health educator; health kit distributor • Incentives: Financial: Revenue (sale of health kits); Non-financial: Training, including training on liaising with government officials
Sajida Bandhu (Bangladesh)	<p>Provides basic healthcare services to SAJIDA Foundation's microcredit members and project beneficiaries through community health workers.</p> <p>Reach: 2 hospitals close to the community; covering 15,000 beneficiaries in pilot phase</p>	<ul style="list-style-type: none"> • CHWs focus on health education and provision of basic services • Sajida hospitals financed through revenue from Sajida Microfinance receive membership/ subscription fees for healthcare card and out-of-pocket (OOP) payments • SAJIDA member families currently recruited from micro-finance participants • Primary CHW function: Health educator; service provider • Incentives: Financial: Revenue; Non-financial: health education, microfinance and micro insurance education, mentoring, provision of mobile/laptop • ICT: CHWs collecting health info through mobile technology (Click Diagnostics), incoming data monitored by SAJIDA doctors

Table 11. Social enterprises: CHW initiatives (continued)

<i>Enterprise</i>	<i>Description</i>	<i>Business model</i>
CommCare (Global)	<p>Open-source mobile health platform used by community health workers to store and access patient information and monitor at-risk patients; enables healthcare program staff to monitor health workers' performance through online reports.</p> <p>Reach: More than a million patients worldwide since 2002</p>	<ul style="list-style-type: none"> • Dimagi employs a tiered pricing model for CommCare services that aligns with each client's health program size and development requirements • Additional revenue collection from premium user and domain services, transaction costs on SMS, and incremental consulting fees • ICT: Mobile job aid to assist CHWs to reach community members; software includes registration forms, checklists, danger sign monitoring tool, educational prompts
Living Goods (Kenya, Uganda)	<p>Provides healthcare services and products and sells essential health products door to door at prices affordable to the poor.</p> <p>Reach: Supported 154,000 pregnancies, treated 564,000 children, and sold 58,000 clean-burning cook stoves (cumulative)</p>	<ul style="list-style-type: none"> • CHWs act as independent agents and sell health and other commodities, similar to a franchise • CHW receive a below-market inventory loan and free 'business in a bag' • Cross-subsidization of prices to allow for affordability of high impact items • CHWs recruited from BRAC borrower base; BRAC branches double as depots and field offices • Primary CHW function: Vendor • Incentives: Financial: Revenue; Non-financial: Training, field mentoring and performance monitoring • ICT: Mobile technology for quality control and patient monitoring; automated SMS reminders to parents of sick children and pregnant women to increase adherence
M-Afya Kiosks (Kenya)	<p>Provides access to basic reproductive health services, antenatal services, and postnatal and well-baby follow-ups and monitors chronic diseases through health kiosks in rural and underserved urban areas.</p> <p>Reach: 2500 clients served (between September 2013 and March 2014) by 9 outlets</p>	<ul style="list-style-type: none"> • Network of kiosks operated by CHWs or nurses, stocked with basic medical equipment and supplies • Progressive buyout of 30-50 percent by CHWs and nurses envisaged • Doctors and clinicians provide mentoring and supervision to CHWs and exercise limited ownership of the kiosks to ensure accountability and quality control. • Primary CHW function: Kiosk operator; service provider • Incentives: Financial: Revenue; Non-financial: Training, mentoring, supervision • ICT: Using M-Pesa for client payments to CHWs
Merrygold Health Network (India)	<p>Provides access to low-cost maternal and child health services by networking with private health service providers as franchisees.</p> <p>Reach: 145,000 visits to Merrygold outlets by 2014</p>	<ul style="list-style-type: none"> • Social franchise where CHWs perform outreach function and create awareness and demand • Franchisees generate revenue through a specialization and a 'low cost, high volume' strategy; patients pay OOP or through insurance schemes • Franchisor receives membership and royalty fees from franchisees • Primary CHW function: Outreach workers for awareness and demand creation • Incentives: Financial: performance-based monthly reward; Non-Financial: Training

Table 11. Social enterprises: CHW initiatives (continued)

<i>Enterprise</i>	<i>Description</i>	<i>Business model</i>
Tunza (Kenya)	<p>Recruits and trains private practitioners to provide a range of contraceptive methods while promoting uptake in the community; provides access to good-quality and affordable healthcare services, including screening for cervical cancer and sexually transmitted infections, HIV counseling, male circumcision, and childhood diseases.</p> <p>Reach: 710,000 visits to Tunza outlets by 2014</p>	<ul style="list-style-type: none"> • Social franchise where CHWs perform outreach and create awareness and demand • Franchisees generate revenue by pricing their services to the patients • Franchisor is in the process of becoming financially viable and will generate revenue through mass procurement and sale of commodities, training packages, brokerage fees for affiliated services (labs, etc.), an increase in franchise fees and introduction of royalty payments for high-income franchisees • Primary CHW function: Outreach workers for awareness and demand creation • Incentives: Financial: monthly reward; Non-Financial: Training
Real Medicine Foundation (India)	<p>Focuses on awareness, identification, treatment, and prevention of malnutrition through use of local community nutrition educators and ICT for tracking and data collection.</p>	<ul style="list-style-type: none"> • Primary CHW function: Outreach workers for awareness and demand creation • Incentives: Financial: monthly salaries and paid travel expenses

viewing, quarterly supervision exercises, and oversight of CHWs. Living Goods has also made an effort to hire and support trained government CHWs wherever they are available and interested and meet its standards. More than a third of Living Goods’ CHWs are government-trained. Bandhan Health Program’s workers are also trained to liaise with governmental health officials and participate in national health campaigns.

The government of India has invested heavily in CHWs. CommCare complements this community-based public health strategy by providing a mobile platform that improves their performance and can be tailored to a range of local contexts (WHO 2013). SAJIDA’s CHWs are connected with health professionals in the formal health system via an mHealth platform provided through a partnership with Click Diagnostics, a global mobile health social enterprise. Living Goods is integrating its treatment and pregnancy registration data with the government’s health information system. Arogya CHWs support reporting by public health facilities by providing them with community data.

Policy and regulation can also help harmonize CHWs’ roles and responsibilities and provide clear standards and protocols to ensure quality. Regulation may consider what happens to other businesses if health entrepreneurs are crowding out existing vendors, as has happened in the case of Living Goods. Government training programs must take into account CHWs supported by market-based approaches to ensure quality and that the patients’ interests are the foremost concern.

Providing incentives to CHWs is essential to reduce attrition. Where direct payments are not possible, training, supervision, and other nonfinancial incentives are key. They can be

co-financed by the government or linked to government training programs. Incentives can include hiring CHWs in public health campaigns.

CHW models require initial donor investment. Many permanently depend on grants. Living Goods, for example, is highly cost-effective, but it still relies on grant funding to cover total operational costs.

Where business models have proven successful, governments may consider financial and administrative support for replicating them in other parts of the country. The government of India has expressed an interest in adopting the Arogya model for its National Rural Health Mission if success can be demonstrated in 100 villages.

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	<p>PROFILE</p> <h2>Sustainable Innovations/Arogya</h2> <p><i>Using information and communications technology to provide basic health services door to door</i></p>
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Challenge

India accounts for almost a fifth of all global maternal deaths (WHO 2013) and a third of all first-day deaths (Save the Children 2013). It also suffers from a doctor shortage, with just 70 doctors per every 100,000 people (WDI n.d.).

The challenge is to provide health care without relying heavily on doctors, especially in rural areas. One strategy for doing so is to provide every village with an Accredited Social Health Activist (ASHA), a village woman who act as an interface between the community and the public health system. ASHAs are contributing to improvements in maternal, newborn, and child health and reductions in associated mortality. More than 820,000 have been trained since 2006, with a focus on preventive care, such as counseling women during pregnancy, accompanying women during delivery, promoting immunizations, and improving newborn care.

Innovation

Sustainable Innovations (SI) has adapted the CHW model with a view to becoming financially sustainable in the next few years. Its Arogya Triage@Home program (<https://www.si-usa.org/arogy>) delivers health check-ups and diagnostic services to people in rural communities in Rajasthan by sending Pannas (a term for CHW that has more positive connotations) door to door.

SI trains young women from the community with secondary education to address common ailments and preventable diseases, such as diarrhea, anemia, reproductive system diseases, worm infestation, and asthma, and conducts hearing and vision testing. In addition to providing medical services, Pannas conduct seminars and meetings at local schools to raise awareness about hygiene and disease prevention methods.

Pannas own their care delivery enterprise; they are social entrepreneurs rather than employees. SI provides them with a portable clinic—a laptop equipped with diagnostic



This health care provider travels with a portable clinic—a laptop equipped with a camera, an oximeter, a blood pressure meter, a peak flow meter, and computerized treatment protocols.

devices such as a camera, an oximeter, a blood pressure meter, a peak flow meter, and computerized treatment protocols. The equipment cost per CHW is approximately USD 1,000–1,200, which includes equipment, laptop, and diagnostic devices and is paid by Arogya.

Pannas relay their findings to health professionals at public facilities for review, advice, and intervention in real time. The Fortis Health Care Foundation provides pro bono physician consultation at Fortis Hospitals. The professionals' response, which may include a recommendation to come in for a consultation, is then communicated to the patients in real time.

Each *Panna* operates its own portable clinic enterprise and prices its own consultations (regular consultation generally cost USD 0.40, with an extra fee sometimes charged for additional services). The more visits a *Panna* makes, the more she earns. It is estimated that *Pannas* earn approximately USD 200 a month from consultations.

SI collects vast amounts of data on patients. It strips the data of patient identifiers and sells the electronic medical records to public and private institutions, including research institutes and pharmaceutical companies. The company shares some of these earnings with the *Pannas*, bringing their average monthly income to approximately USD 300–400.

Impact

Arogya is currently serving about 45,000 people. Grants of USD 400,000 from the Merck Foundation and the Jain Foundation will be used to roll out the model and reach another

100,000 people. The program has also created income opportunities for young women in 15 villages. The holistic model includes innovative components that are being refined to become sustainable.

Scaling Up

Scaling up depends critically on buy-in—by communities, local health facilities, and the government. Soon after the project began, SI recognized that it would succeed only if villagers saw immediate results. To do so, it began offering vision and hearing testing (Bitsaa International 2012).

The program initially faced problems of buy-in from local public health facilities, whose staff perceived it as a competitive threat. Buy-in was achieved after the facilities recognized that the *Pannas'* reports could help them meet their reporting obligations and provide them with early warning of epidemics. Government buy-in was facilitated by providing it with a reliable channel through which to distribute information (on free drugs, for example).

Before being able to replicate on a larger scale, SI will have to first prove to the government that the model works in 100 villages in Rajasthan. It will then need to conduct a feasibility assessment and present a project plan for an additional 1,000 villages, demonstrating that the model can work on a larger scale. If it succeeds, the government may adopt the Arogya model more widely through its National Rural Health Mission and roll it out as a public-private partnership with SI.

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	<p>PROFILE</p> <h2>Living Goods</h2> <p><i>Using female microentrepreneurs to provide essential health products to rural homes</i></p>
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Challenge

Millions of people in Uganda lack access to basic medical care. Public health facilities provide free treatment of malaria and other life-threatening diseases, but the indirect costs of care, including transport and lost work, make treatment unaffordable for many people, and drug stock-outs are common.

Where barriers to access exist, patients often rely on informal and unregulated private health outlets, many of which dispense counterfeit drugs. The challenge is to reach poor people with affordable medicines and basic medical care.

Innovation

In Uganda CHWs—whom Living Goods (www.livinggoods.org) calls *micro-entrepreneurs*—go door to door selling medicines, health products and services, and household goods. Services include education and counseling on family planning; registration and tracking of pregnancies by mobile app; prenatal care; and diagnosis and treatment of diarrhea, malaria, and pneumonia. Products include contraceptives, clean delivery kits, medicines for common childhood diseases, fortified foods, and household goods, such as detergent, solar lights, clean cook stoves, and water filters. To make essential medicines affordable, Living Goods sells them at up to 30 percent below market prices.

Micro-entrepreneurs must be literate in both the local language and English and live in the geographic location where they operate. They receive three weeks of training on the basics of health care provision and common diseases, as well as refresher training and supervision.

To start their micro-franchise, micro-entrepreneurs receive a below-market loan, which they pay back out of their earnings within 48 weeks. They use the loan proceeds to purchase



A team of micro-entrepreneurs offer door-to-door community health services in Ugandan underserved households

stock from the Living Goods headquarters, which purchases in bulk from a single supplier and directly from manufacturers. Living Goods pays its micro-entrepreneurs based on performance (for identifying pregnant women and visiting newborns within the critical first 48 hours of life, for example) and allows them to retain 15–20 percent of their sales. The average micro-entrepreneur works part-time and earns a monthly income of approximately USD 15–20.

Living Goods equips micro-entrepreneurs with a smartphone with apps that help them register and support pregnant women, accurately diagnose childhood illnesses, send SMS adherence reminders, and ensure effective follow-up. Its analytics and reporting system provide real-time data to drive rapid, informed decisionmaking at every level of operations. The vast mobile phone coverage even in rural areas enables villagers to contact their micro-entrepreneur around the clock.

Living Goods partners with the government of Uganda in recruiting and training micro-entrepreneurs. In some areas, district health teams are engaged in the recruiting and supervision process. In other areas, Living Goods trains government CHWs.

Impact

The 1,200 micro-entrepreneurs who work for Living Goods Uganda serve nearly one million people. Their work has reduced child mortality by more than 25 percent, according to Living Goods, and decreased the sale of counterfeit drugs, by both raising awareness of the existence of such drugs and reducing the average price of legitimate antimalarial drugs by 15–20 percent.

Scaling Up

Living Goods' micro-franchisees are financially viable, and the organization is highly cost-effective, costing less than USD 2 per person per year. It continues to rely on grant funding of approximately USD 8 million to cover its operations in Uganda and Kenya and its advocacy and partnerships team.

Quality assurance and reputational risk are key challenges in growing the model. Living Goods understands that it must maintain and improve service quality as it grows rapidly so as not to undermine its credibility in the community.

Living Goods' strategy increasingly relies on working with partners to implement replications of the model at scale. Partners include social marketing organizations such as PSI and MSI, as well as large NGOs such as CARE Zambia. Working with major multinational NGOs is at the core of Living Goods, which started as a collaboration with BRAC Uganda. Although such partnerships carry significant opportunities for Living Goods, they also imply accepting a higher-risk strategy, because they involve less control and influence over operations.

Using Telemedicine to Treat Patients in Underserved Areas

Technology provides patients and doctors with access to specialists, greatly reducing the need for costly travel

HIGHLIGHTS

- Telemedicine is the remote delivery of healthcare services via information and communications technology (ICT) to diagnose, treat, and prevent disease and injury.
- It allows rural health practitioners to consult with city-based specialist doctors to provide diagnoses and treatment plans for rural patients, so patients don't have to travel.
- It also provides distance learning opportunities for local health workers.



Summary

Millions of people living in rural, remote areas must travel long distances, at enormous cost, just to receive a medical diagnosis. Telemedicine allows local healthcare providers to consult with specialists in towns and cities, allowing many patients to be treated locally.

Development Challenge

Millions of people in rural and remote areas lack access to even basic medical care. Patients who need specialized care must travel long distances, at enormous cost, just to receive a diagnosis. Being able to obtain medical care where they live could be life-changing for these people.

Business Model

Telemedicine is the remote delivery of healthcare services via ICT for the purpose of diagnosing, treating, and preventing disease and injury. It can extend healthcare to people who lack access to it because they live too far from a health facility or the facility lacks the necessary equipment or trained personnel. Telemedicine can also be used to train local healthcare workers and provide them with professional support.

Telemedicine is rarely a stand-alone business model. Especially in low-income settings, it tends to be a turnkey solution that is plugged into existing business models, such as chain clinics or hospitals, leveraging existing providers and structures and extending services to new areas.

Telemedicine is used by a healthcare professional as part of their interaction with a patient at a clinic or hospital. One form of telemedicine that uses wireless devices and cell phone technologies is mHealth, or mobile health. mHealth is usually used on consumer-facing devices. The use cases are thus slightly different; telemedicine is more established and can allow for more in-depth consultation since a healthcare professional is physically present. There is more possibility to prescribe medicines or perform examinations.

Components of the Model

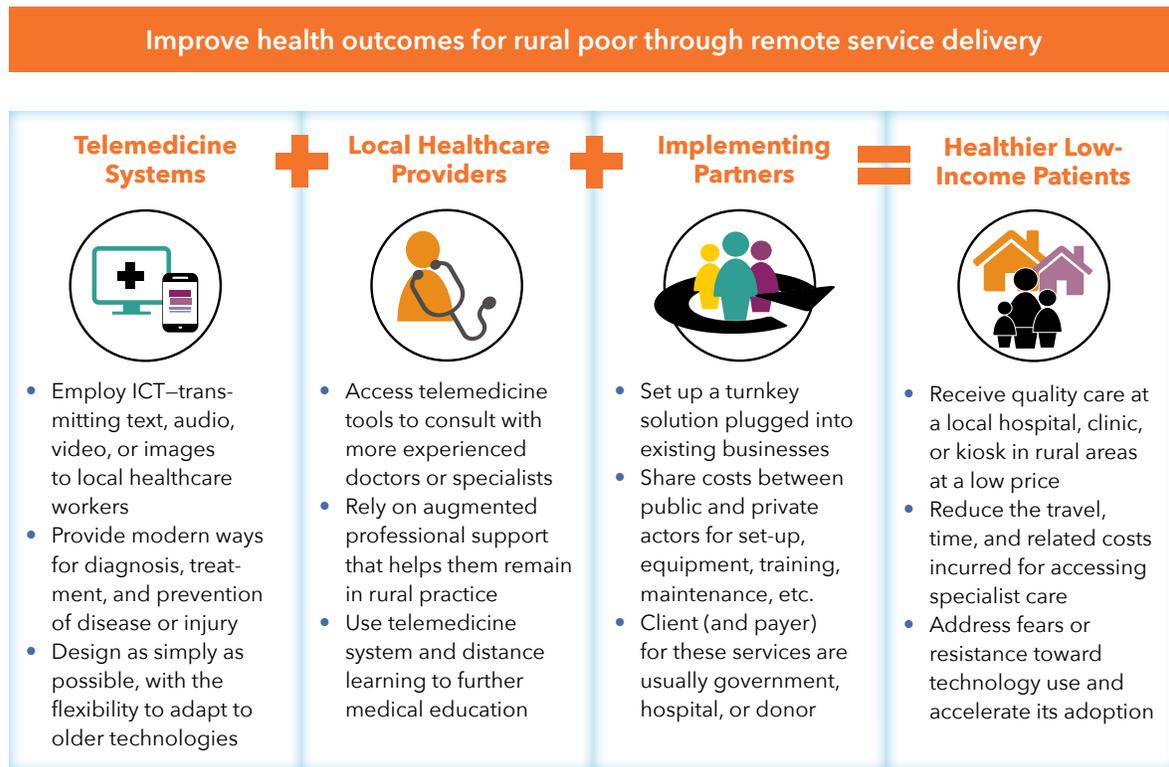
Telemedicine includes teleconsultations, videoconferencing, and remote patient monitoring (see figure 7). Patients usually access telemedicine at a local hospital, clinic, pharmacy, or kiosk, where local healthcare workers consult with doctors or specialists on diagnosis and treatment options. Telemedicine facilitates access to expert healthcare for both patients and local healthcare workers in several ways:

- It provides healthcare workers at local hospitals, clinics, or pharmacies access to expert help from more experienced physicians or specialists.
- It offers reassurance to both local healthcare workers and patients.
- It reduces the travel time expense and stress associated with seeking specialist care.

It also encourages local healthcare workers to remain in rural areas, by augmenting professional support and allowing them to continue their professional development.

Telemedicine transmits information via text, audio, video, and still images to a range of specialists. Photographs of simple skin tumors can be transmitted to large hospitals for interpretation and consultation; X-rays can be sent off for a specialist opinion. Where a stable Internet connection exists, patients can videoconference with a healthcare professional or email information for analysis. Doctors can monitor blood pressure or glucose levels of a clinic's patients by looking at a computer screen.

Figure 7. Features of the telemedicine model that can improve health outcomes for rural poor



Cost Factors

Operating a telemedicine system involves purchasing the equipment needed to set up the system in the hospital, clinic, or pharmacy; maintaining the equipment; training the physicians and local healthcare workers on the technology; and compensating the physicians. Public and private actors usually share these costs.

Revenue Streams

Most telemedicine programs and services are subsidized by governments or international donors. A few social enterprises are trying to operate financially self-sustaining telemedicine services. Table 12 illustrates examples of services provided and costs.

Financial Viability

The costs of telemedicine are often high in low-income countries, because of low awareness among both patients and local healthcare workers, low information technology literacy, and limited access to infrastructure and technology. Because hospitals are generally unable to cover all costs, most projects are at least partially funded by local governments or development partners.

Financial viability can be greatly impacted by external factors, such as poor Internet connectivity. The Opportune Breast Cancer Screening and Diagnosis Program (OBCSDP) was initiated in Mexico in 2006 to reduce breast cancer mortality in women between the ages of 50 and 69. The federal and state governments as well as nonprofit groups provided approximately USD 2.8 million to set up this telemedicine program in 11 states. The program originally aimed to become financially self-sustaining by 2012, but it found that poor Internet connectivity significantly reduced uptake. Diagnostic centers that were able to perform more than 150 screenings per day averaged less than 50. OBCSDP is working to acquire more reliable technology. In the meantime, doctors must place image scans on compact discs and use ground transportation to deliver them. Results can take up to three weeks to deliver. Mexico's government and nonprofit partners have remained supportive, but such delays and challenges often cause pledged program money dry up, putting the program at risk.

Some models could eventually be self-sustaining. VSee, created by a team at Stanford University, is a screen share app for iPad that allows five parties to video. The technology allows high-quality ultrasounds to be conducted with only USD 300–4,000 worth of equipment—a fraction of the price of an ultrasound machine (up to USD 30,000). VSee is currently funded by Salesforce and the National Science Foundation, but it is a model that could be profitable.

Partnerships

Successful telemedicine projects align the interests and resources of various stakeholders to create a solution that is tailored to the local market. These partners include private companies; governments and development partners; local clinics and pharmacies; and remotely located hospitals, doctors, and specialists.

- Private companies develop and implement telemedicine solutions.
- Service providers set up telemedicine systems for hospitals, providing monitors, Internet connections, technology suited to the environment, and training on how to use it. Telemedicine is therefore more of a B2B (business-to-business) than a B2C (business-to-consumer) operation.
- Governments and development partners provide funding, usually in the form of joint ventures by international donors and nonprofit organizations. Governments are also key to expanding rural access to broadband Internet connections, organizing national agencies for the development and promotion of telemedicine, and crafting policies that ensure an efficient and safe telemedicine experience for patients

and healthcare providers. The Chinese government's National Health and Family Planning Commission of the People's Republic of China (NHFPC) created guidelines on telemedicine in August 2014. They address how to actively promote the development of telemedicine services, clarify service items and ensure the quality and safety of telemedicine services, and protect the legitimate interests of both physicians and patients (Ferris and Lacktman 2014).

- Local clinics and pharmacies handle interactions between the telemedicine technology and the patient. They are trained to carry out parts of the consultation and send the doctor or specialist the necessary information.

Hospitals, doctors, and specialists provide expert advice, diagnoses, and treatment options to local healthcare staff. They may also provide continuing education and professional development of local staff.

Implementation: Delivering Value to the Poor

Awareness

Building awareness on the benefits and appropriate use of telemedicine is key to reducing resistance to the technology and accelerating its adoption among both healthcare workers and patients. Concerted advocacy on the benefits and the appropriate use of telemedicine can help address fears or resistance toward technology use and accelerate its adoption among both health professionals and patients.

Acceptance

Many local healthcare workers are unfamiliar or uncomfortable working with computers; they also fear that telemedicine may lead to job loss or a reduction in their bedside presence. To gain their acceptance, telemedicine programs must be designed as simply as possible. To allay anxiety about technology, Sanjeevani, an Indian company, integrates older technology, such as telephones and simple document scanners, with sophisticated video conferencing technology (Sood and Bhatia 2005). This helps bridge the gap in healthcare professionals' experience between old technologies and new, and has the added advantage of being a reliable alternative if Internet connections are slow or lost. The older technology also serves as a backup if the newer technology fails.

Availability

Given the scarcity of licensed doctors and specialists in many emerging and developing markets, telemedicine allows low-income patients access to highly professional care while

potentially eliminating costs such as travel expenses for specialists and patient transfers. The level of service provision will often depend on the ICT infrastructure available. For example, there are two levels of development in rural India. Rural hospitals in larger rural cities, which have access to ISRO satellite network are able to get support from Apollo Telemedicine, Narayana Hrudayalaya, and other major hospitals.

In even more remote, rural areas, infrastructure is much more limited and large scale providers/ hospitals are not present, and therefore telemedicine may not be available. In response, mobile health clinics, such as those created by Apollo Hospitals, Philips, ISRO, and the Dhan Foundation as part of the Distance Healthcare Advancement Project (DISHA) project, enable access to medical care for individuals who are even more remote than existing clinics can handle. With the decreasing cost of mobile plans, and increased use of mobile phones, the health hotline (e.g., MeraDoctor) has emerged as an alternative solution for customers who do not want to travel long distances to clinics for relatively minor health questions.

Affordability

Telemedicine creates value for a healthcare system by providing more access to specialists at a minimum price (once the system is set up), providing modern ways of working with patients and collecting data. It also allows healthcare providers to continue their education on a regular basis using distance learning—perhaps with bigger hospitals in the region or even international partners.

As a business model, service providers often set up a telemedicine system for a hospital. They can work with the hospital to remain within a certain budget and leverage existing technologies being used to ensure affordability. The main client (and payer) for these services are usually a government or a hospital. Services are provided in the form of a full telemedicine setup, which usually includes monitors, internet connections, technology suited to the environment, and some sort of training on how to use it. The end user (the patient) will rarely pay for the telemedicine services. They will most likely pay the price for a usual consultation regardless of whether it includes telemedicine or not. Therefore, telemedicine is much more of a B2B model than a B2C model.

Results and Cost-Effectiveness

Several programs have demonstrated results. Narayana's hospital and healthcare network in India connects 850 centers from around the world to its premier facility in Bangalore. Its cardiologists remotely review 600–700 ECGs a day.

MeraDoctor, a remote consultation service in India that uses WhatsApp and telephones, has provided more than 55,000 consultations on more than 400 ailments to its estimated 500,000 customers in rural areas of India. It has reduced the need for repeat visits to

traditional doctors for simple medical conditions and helped quickly resolve questions. By avoiding overmedication, MeraDoctor also saves patients money on medicine.

There is a need to strengthen the evidence of telemedicine programs by standardizing reporting on outcomes, cost-effectiveness versus traditional healthcare delivery, and increased coverage to remote areas (Khanal and others 2015). A standard reporting toolkit would not only provide stronger evidence of impact, it would also enable governments, international donor agencies, and investors a means of assessing the potential of telemedicine.

Scale and Reach

Telemedicine extends the reach of existing health facilities and providers by increasing access to healthcare for end-users. In higher-income countries, with good infrastructure, institutions, and awareness, telemedicine is reaching millions of people. Narayana Health has treated 54,000 patients through its ECG networks, examining approximately 450–500 ECGs a day. The Narayana Health network connects 130 centers via teleconsultation, including 53 in Sub-Saharan Africa. Narayana Health which boasts the largest telemedicine network in the world, had 800 telemedicine centres in India and another 100 centres spread across 60 countries.

The Indian Space Research Organization (ISRO) connects 22 specialty hospitals, such as Narayana Hrudayalaya, which focuses on cardiac care, with 78 rural and remote hospitals across India through its geostationary satellites. ISRO has provided more than 25,000 patients with teleconsultation and treatment. Narayan Hrudayalya reports that it treated 17,400 patients using telemedicine connectivity in various parts of India, mainly rural areas, between 1999 and 2005. Other telemedicine programs have reached only a much more modest scale, largely because of weak Internet connectivity.

Improving Outcomes

Telemedicine provides people in poor communities with access to specialized care not available in their own communities, in many cases obviating the need for them to travel. It facilitates cross-site and intercountry collaboration, providing healthcare professionals with access to otherwise unavailable specialist advice.

Telemedicine is also a good way to train local healthcare workers remotely (House and others 1987). World Health Partners, an Indian NGO, has expanded its telemedicine network in Uttar Pradesh to include approximately 1,200 “Sky Care Workers” and 120 entrepreneur-run centers, which it has branded “Sky Health Centers” (Knowledge at Wharton 2012). Sky Care Workers are trained to diagnosis patients, perform symptom-based treatments, use teleconsultations, and make referrals to Sky Health Centers.

Cost-Effectiveness

Telemedicine is more of a cost-saving mechanism than a money-making mechanism for a health business model. Telemedicine helps save costs by offering many more services to a hospital or clinic's patients without in-house specialists or the need for transfers to other facilities that can be time-consuming and costly. It is also a way for hospitals and clinics to modernize their services, and to provide their staff with ongoing learning from hospitals in the region, country, or even internationally. This further education via videoconference is critical, especially for rural practitioners to keep abreast of the latest in medicinal practice.

At the patient level, telemedicine provides patients access to services previously not available—and allows them to save money on specialist consultations. Apollo Hospitals charges USD 20–30 for a teleconsultation, and estimates the total cost of a traditional consultation at approximately USD 100. Research showed that only 25 out of 100 patients needed to physically see a specialist after a telemedicine consultation. The other 75 people were saved a referral to a specialist.

Scaling Up

Challenges

Telemedicine has enormous potential, but it faces significant barriers to adoption in low- and middle income markets, for a variety of reasons:

- **Lack of infrastructure, particularly broadband:** Broadband networks that can transmit videos are still limited in many areas, including in China, India, Indonesia, the Philippines, and Vietnam. Access is growing, however. It will lead to increased acceptance of telecommunication as a tool for health.
- **Low awareness of benefits:** Some patients, particularly older patients, are hesitant about the new technology. Many hospitals and clinics perceive that telemedicine solutions are too expensive to implement.
- **Lack of or dependency on public support:** Telemedicine solutions tend to be government-funded, at least in their early phases. If funds dry up and there is no alternative business model, the system becomes unsustainable.
- **Lack of regulation and legislation:** No international framework on telemedicine exists; there is little consensus or understanding on what constitutes a high-quality telemedicine service or attempts to develop standards. Standardization of both hardware and software, as well as guidelines for practice, would help program managers overcome interoperability, portability, and security issues (WHO 2010).
- **Legal liability issues:** Some medical practitioners may be reluctant to practice telemedicine for fear of medical indemnity issues.
- **Privacy concerns:** To address concerns about privacy, nonprofit organizations such as the Center for Connected Health are working to make Skype compliant with medical codes relating to privacy so that doctors can communicate over it without

breaching doctor-patient confidentiality. While Skype's encryption methods are strong, overall it does not appear to meet HIPAA (Health Insurance Portability and Accountability Act) compliance standards. Organizations that use the software to communicate with patients over the Internet should be aware of the risks involved and consider using other video conferencing platforms instead.

Role of Government and Public Policy

The government can address the challenges facing telemedicine in many ways:

- ***Improving infrastructure:*** Government can help increase broadband access, especially in rural areas not served by private sector telecommunications companies.
- ***Institutionalizing telemedicine:*** Countries can establish national agencies for the development and promotion of telemedicine and its applications. To spur governments to do so, promoters must present policymakers with evidence of the extent of its benefits, as the Nigerian Telemedicine Development Alliance (NTDA), a web-based advocacy group, has done.
- ***Adopting legislation:*** Legislation is crucial to protect electronic personal and health-related data and ensure that patients can access and control their own health records. Special actions are needed to protect children from harm on the Internet. Laws that require insurance companies to officially recognize telemedicine and reimburse doctors for its use can be beneficial to telemedicine adoption.
- ***Providing funding:*** Governments and international donors are the main providers of funds for telemedicine projects in most developing countries. They may provide seed capital for setting up the project, compensating the physicians for their time, or raising awareness. Most funding comes from multiple institutions.
- ***Building awareness:*** Public sector actors can help promote telemedicine by identifying and analyzing telemedicine usage and policies worldwide.

Table 12. Social enterprises: Providers of telemedicine services

<i>Company</i>	<i>Country</i>	<i>Description</i>
Apollo Hospitals Group	India	Provides camera over ICU beds that can be remotely switched on. Consultants can use this facility to make additional virtual visits 24/7 and remotely re-evaluate the patient. Family can also visit their loved ones from home in this way.
Aravind Eye Care Systems	India	Provides eye care through internet-based information technology (Via high-speed wireless video-conferencing) that allows patients in rural areas to be remotely diagnosed by ophthalmologists at the base hospital.
CISCO Brazil and Federal University of Sergipe	Brazil	Provides pediatric care as well as continuing education programs to state health professionals.
Doct-hers-in the-House	Pakistan, but aimed at Middle East and North Africa in the long term	Uses technology to connect female doctors who cannot access the workplace to rural areas without doctors.
Mashavu Networked Healthcare Solutions	Kenya, Tanzania	Uploads to the web basic medical information collected by trained operators at kiosk stations. Upon receiving the information, local doctors provide recommendations and indicate whether the patient needs to travel to a hospital or clinic. Public health officials can use the information to evaluate trends or possible epidemics. Social enterprise venture of students at Pennsylvania State University.
Merck	Ghana, Kenya, Uganda	Provides e-diagnostic and consultation clinics at Kenyatta National Hospital in Nairobi and Machakos Hospital. The clinics allow patients and healthcare providers in remote areas to interact with specialists at Kenyatta Hospital using IP and video conferencing.
Narayana Health	India	Pioneered concept of telemedicine in India, in collaboration with the Indian Space Research Organization (ISRO).
PLDT-Smart Foundation	Philippines	Cisco HealthPresence solutions combine network, mobile, cloud, and video technologies to link medical providers with patients and colleagues in underserved communities.
Telemedicine Africa	South Africa	For-profit company offers telemedicine solutions, including training, implementation, and consulting services to the Department of Health and other health service delivery partners.
University of Bamako/Société Malienne d'Imagerie Médicale	Mali	IKON Project, a tele-radiology project developed by three medical students at the University of Bamako, allows healthcare professionals to send and receive medical information over the Internet.

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 <p>Telemedicine Africa</p>	<p>PROFILE</p> <h2>Telemedicine Africa</h2> <p><i>Providing remote healthcare in South Africa through a virtual consultation center</i></p>
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Challenge

Rural health care in South Africa is poor. Lacking specialists, rural hospitals rely on transport to larger medical institutions, which may also lack the needed equipment and personnel. Telemedicine can link facilities to bring specialist opinions to rural patients' bedsides. The technology can obviate the need to transport patients to more sophisticated facilities, a practice that is expensive, complicated, and onerous for both patients and their families.

Innovation

Founded in 2008, Telemedicine Africa (www.telemedafrica.co.za) is a for-profit company that provides training, implementation, and ongoing consulting services over the Internet. In Limpopo, South Africa's poorest province, it works with 14 regional hospitals, covering the entire province. The company operates a virtual telemedicine consultation center that makes specialists and general practitioners available to patients across Limpopo. The center is linked to patients through a variety of partners, including rural clinics, village hospitals, and provincial hospitals; mining clinics; schools; and correctional facilities.

Telemedicine Africa sets up a virtual telehealth center for each partner, providing telemedicine and videoconferencing equipment as well as an administrator and a technician, who assist local healthcare workers with the use of the equipment. Assistance is available to any partner site once it purchases the equipment and is connected to the virtual telemedicine consultation center. South Africans are covered by a health insurance under which they pay USD 2 per consultation. They pay no extra charge for the telemedicine consult, which is paid for by the government. Telemedicine Africa also provides assessment for tele-surveillance (the use of data collection tools to gather information) in 14 other African countries and coordinates telemedicine training for local staff.

Impact

The system provides rural residents and prisoners with access to good-quality care that would otherwise be unavailable and saves millions of dollars on travel and transport. It also improves training of healthcare personnel. Telemedicine Africa is having an impact in other ways as well. It helped the Southern African Development Community (SADC) prepare a regional report on human trafficking by allowing its facilities to be used to interview victims, police officers, social workers, and victim protection activists. Its technology can also be used to track outbreaks and other important health-related trends.

Scaling Up

Several factors account for Telemedicine Africa's success. Patients are more at ease and accepting of the use of telemedicine than they once were. It has tapped relevant contact points for rural South Africans, such as schools, mining clinics and prisons.

However, key challenges to scaling include the slow rate of technology adoption; weak Internet connectivity, especially in rural areas; and limited funding as most telemedicine programs are funded by governments or donors. Still, there are strong potential clients in remote areas, such as mining companies and prisons, that could also benefit from telemedicine services.



Challenge

For 70 percent of the Indian rural population, the patient-physician ratio is a mere 0.39 per 1000 people—compared to the country average of 0.7 per 1000 (World Bank World Development Indicators). The leading causes of death in India are ischemic heart disease, chronic obstructive pulmonary disease, and stroke, accounting for 30 percent of all deaths. And while access to primary care physicians is limited, access to specialists, such as cardiologists, is nearly impossible. As a result, rural patients are unable to receive the specialty care they need in a timely fashion, and often cannot afford the expenses that result from travel to urban areas, overnight stays, and expensive tests.

Innovation

Narayana Hrudayalaya (www.narayanahealth.org) recognized early on that slow medical response time, lack of availability of specialty care, and the stark urban-rural divide in terms of healthcare access and follow-up have made it all but impossible to get cardiac consultations in rural areas. In 2001, Narayana pioneered the concept of telemedicine in the country. The main telemedicine services Narayana provides are a Trans-telephonic Electrocardiogram (Tele-ECG) and a Tele-consultation. The interpretation of ECG tracings is an example of a process that is well suited to telemedicine. While an ECG is a simple test to perform, it takes significant amounts of training to interpret the tracing. Local healthcare providers can easily perform the ECG and send the tracings in bundles to those trained to interpret them. Narayana receives data from 600–700 ECGs per day, responding to each in under a minute.

The ECG is provided for free to the patient by implementing cost-saving methods such as accepting donations, relying on digital X-rays rather than more expensive films, and reducing inventory and processing times using comprehensive hospital management software, as well as increasing patient volume to maximize use of infrastructure and reach economies of scale. Narayana also provides tele-consultations at cost. Narayana charges according to the

patient's ability to pay, and it cross-subsidizes its services for the poor—with approximately 60 percent of treatments provided below cost or for free. Narayana also provides medical education training via its telemedicine channels for doctors in other parts of India, Africa, or elsewhere in the world.

Impact

Today, Narayana's telemedicine program, one of the world's largest, connects 850 centers across the world to its specialty hospitals, providing low-income patients in rural areas access to quality cardiac care. The impact of providing access to ECG far exceeds its costs. Early detection of acute myocardial infarction or other abnormalities using ECGs, and transmission of information to a physician can accelerate management of the patient considerably. Even patients with pre-existing coronary artery disease and chronic heart failure can be managed more safely and effectively with regular telemedicine consultations, giving them ongoing access to follow-up care.

Scaling Up

Of its 850 centers, 53 are in sub-Saharan Africa. Narayana benefits from large economies of scale that allow it to cross-subsidize its patients. Taking ECG tracings can become an extremely standardized process, making it easier to work cost effectively. Moreover, prior to free software such as Skype being commercially available, telemedicine consisted of expensive customized medical software integrated with computer hardware along with the diagnostics instruments at each location, which was much more expensive to implement and upkeep. Skype is now the primary means of connecting doctors and patients, reducing costs.

Serving the Healthcare Needs of the Poor with Specialized Clinics

Through cross-subsidization and hub-and-spoke models, peri-urban and rural, lower-income populations can better access affordable, high-quality specialized healthcare

HIGHLIGHTS

- High specialization and streamlined procedures of health clinics allow for good quality and low-cost results.
- Innovative approaches reduce operating costs.
- Cross-subsidization allows poor patients to access care and helps make the clinic financially sustainable.



Summary

Poor populations in peri-urban and rural areas lack access to affordable specialized healthcare and products, including simple products such as eyeglasses. Specialty clinics use a high-volume/cross-subsidization model to meet the massive patient demand and medical needs of the underserved, particularly in the areas of eye care, reproductive health, kidney care, and dentistry.

Development Challenge

Most health systems in developing countries struggle to meet patients' most basic medical needs. Public services are often extremely overburdened, and private services are usually too expensive for low-income segments of the population to afford.

For poor people in rural and peri-urban areas, medical care requiring specialized physicians or equipment is even farther out of reach, in terms of both geography and cost. Millions of people do not receive specialized treatment or basic corrective surgeries because care is not available or the costs of travel and surgery are too high.

In response to this problem, highly specialized healthcare clinics are emerging in developing countries that make services more affordable for the poor and underserved. Their innovative business models reduce operating costs and adopt a cross-subsidization revenue model in which wealthier patients pay more and poorer patients pay less (or nothing at all). These clinics, often set up as chains, frequently use a pyramid, hub-and-spoke, or branch structure, consisting of a main hub hospital, peri-urban centers, and rural mobile camps with community outreach activities. They manage a high volume of patients through a streamlined and standardized yet patient-centric system.

Business Model

Components of the Model

Single-specialty clinic chains provide the poor with access to specialized medical services. The model builds standard of care protocols that result in economies of scale, which help drive down costs. These clinics identify, triage, and channel patients; standardize procedures in ways that maximize efficiency gains and quality assurance; develop innovative ways to ensure high patient volumes and facilitate uptake; recruit and train staff and adopt measure to retain them; and cross-subsidize services in order to be able to provide free or low-cost services to the poor.

Eye care was one of the first areas to adopt the single-specialty clinic model. Many innovative eye care business models originated in India.

The model is being applied to many subspecialties, such as reproductive health, dentistry, diabetes treatment, and kidney care (table 13). It lends itself to areas where treatment can be provided as an outpatient service; patients pay out-of-pocket; and demand is high and unmet by public or other facilities. Replications of the model have revealed the importance of factors in the enabling environment, such as low regulatory barriers, low costs of labor and materials, the existence of a paying patient segment, and the interest of the owner to serve a social mandate.

Single-specialty clinic chains are often adding or expanding the activities conducted through their tertiary centers. Often the tertiary center is a financially autonomous non-profit entity due to research and consulting revenues. These facilities—such as the Centre of Excellence at the L V Prasad Eye Institute (LVPEI) and the Lumbini Eye Institute—serve as the chain's control center (figure 8).

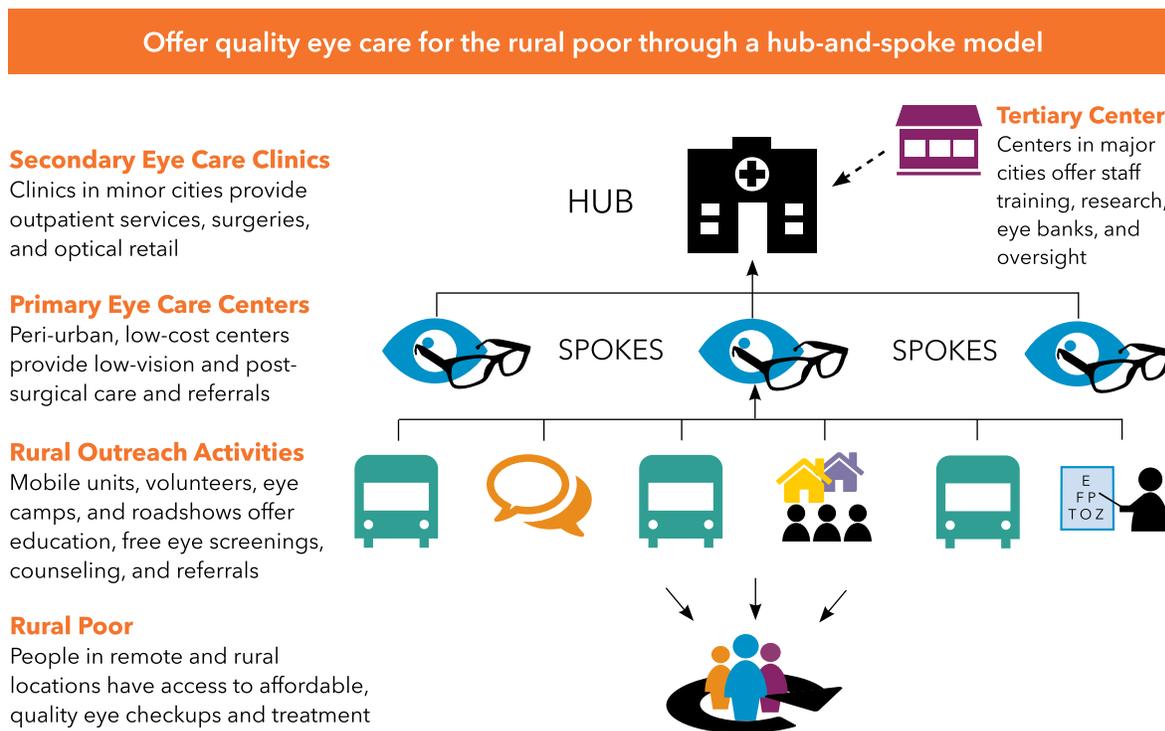
As facilities develop, they often conduct research and provide training and mentoring. The LVPEI, for example, allows its specialists to devote one-third of their time to research. The Pushpagari Eye Institute (PVRI) runs a competitive donor-funded fellowship program. Bringing training in-house enables clinic chains to overcome common human resource chal-

Table 13. Examples of single-specialty clinic chains that reach the poor

<i>Specialty</i>	<i>Example</i>
Eye care	
<p>Eye-related diseases affect 285 million people worldwide. Approximately 80 percent of visual impairment is curable. It is estimated that in the next nine years the number of blind people aged 50+ will grow in all WHO Regions, particularly in China, India, Southeast Asia and the Eastern Mediterranean, unless action is taken to prevent and cure the main causes of visual impairments (WHO 2010).</p>	<ul style="list-style-type: none"> • ERC Eye Care provides accessible and affordable eye care to poor populations in Assam, India through a hub-and-spoke model that includes one central hub hospital, seven peri-urban vision centers, mobile screening and treatment camps in rural areas, and trained assistants from the community to conduct outreach. • salaUno, created in 2011, is a for-profit enterprise that provides eye care to the poorest people in Mexico. It educates doctors and nurses and collaborates with public, private, and non-profit institutions.
Dental care	
<p>Dental cavities cost the world almost five million disability adjusted life years in 2000 (IHME n.d.). Globally, the distribution of dentists is extremely unequal, with 1 dentist per 5,000 people in advanced regions and 1 dentist per 150,000 people in Africa (FDI World Dental Federation 2014). Severe periodontal disease can be associated with diabetes, arthritis, low birthweight, and cardiovascular disease.</p>	<ul style="list-style-type: none"> • Sorridents is a Brazilian network of wholly owned and franchised dental clinics on the outskirts of urban centers. Through its non-profit institute, Sorridents operates mobile clinics that provide dental care to the poor. • Vasan Dental Care reaches low-income people in India through neighborhood daycare clinics and dental screening camps in rural areas.
Kidney care	
<p>Lack of access to dialysis, which is required to treat end-stage renal disease, causes one million deaths annually in developing countries (Couder and others 2011). Because of its cost, most of the two million people worldwide receiving renal replacement therapy live in five developed countries.</p>	<ul style="list-style-type: none"> • NephroPlus Kidney Care Centers in India look after all requirements of a dialysis patient, and help the patient lead a life as close to normal as possible. The clinics ensure that patients are very involved in their care. For example, peritoneal dialysis exchanges at NephroPlus are usually done by patients themselves after being trained by the center's technicians and nurses. Most of its facilities are located in major hospitals. • RG Stone Urology and Laparoscopy Hospital pioneered the process of low-cost, high-technology, minimally invasive urinary stone management and removal. It operates 16 sites across India.

lenges and become self-reliant. LVPEI has trained more than 18,000 eye care professionals for employment at its own facilities and increasingly for other institutes in India and abroad. The Lions Aravind Institute of Community Ophthalmology (LAICO) trains both clinical staff and managerial personnel in the development and implementation of efficient and sustainable eye care programs in India and abroad.

Figure 8. Features of specialized eye clinic hub-and-spoke healthcare model



Cost Factors

Focusing on a single disease that can be treated on an outpatient basis makes this model less costly than in-patient or multispecialty hospitals. It also makes standardization and quality easier to achieve. The model keeps operating costs low by improving efficiency and achieving economies of scale through high patient volumes and extensive outreach activities. At the Aravind Eye Care System (AECS), the average doctor performs 2,400 cataract surgeries a year; LVPEI’s surgeons average 1,000–1,500 cataract surgeries a year. These volumes are up to six times the average annual rate of 400 surgeries per doctor in the United States (Lindstrom 2015).

Efficiency gains also come from vertically integrating the supply chain and adopting cutting-edge products and processes and innovative technologies. SalaUno, in Mexico, uses small-incision cataract surgery, computer software for patient flow optimization, and telemedicine to verify referrals and advise on complicated cases. It also purchases in bulk, minimizes waste, and partners with universities, detection centers, etc., to develop low-cost health technologies.

Many enterprises have developed innovative cost-cutting measures. SalaUno formed a pro bono partnership with a public relations agency to raise awareness. LVPEI negotiated land donations from socially minded community members and subsidized land from the government. AECS collaborated internationally to create and manufacture a low-cost intra-ocular lens.

Enterprises have also adopted approaches to expand patient volume. LVPEI and ERC Eye Care train community-recruited vision assistants to make house calls in rural areas. SalaUno uses social media, television, and radio to raise awareness among new patient segments.

Revenue Streams

Cross-subsidization is one of the most innovative aspects of the model (see table 14). Clinic chains offer tiered price and service options to patients based on their willingness to pay. Using standardized, simple, and transparent price and service lists (akin to menus) at the point of registration, patients self-select the level of service at the price they are willing to pay. Wealthier patients often opt for premium add-on services, such as private recovery rooms and reduced waiting times. The higher fees charged for these services subsidize poorer patients. Segmenting patients based on willingness to pay rather than ability to pay may crowd out services for which costs could be recovered (Radhakrishnan and others 2015).

EYE-Q uses geography as the basis for cross-subsidization. An operation that costs USD 360 in an urban center costs USD 260 in a peri-urban area. Business units within the company also cross-subsidize one another. Profits from the sale of eyeglasses or other products sold through optical and pharmacy shops, for example, are used to subsidize free services. More commercial-centric clinic chains often provide free services and cross-subsidization at arm's length through a foundation or separate legal entity.

Table 14. Examples of cross-subsidization of services by eye care clinic chains

<i>Enterprise</i>	<i>Method of cross-subsidization</i>	<i>Percentage of patients receiving free services</i>
Aravind Eye Care System (India)	<ul style="list-style-type: none"> Tiered price and service scales based on willingness to pay 	23
EYE-Q (India)	<ul style="list-style-type: none"> Tiered price and service scales, based on location of service delivery Eye-Q Foundation subsidizes free services 	n.a.
LV Prasad Eye Institute (India)	<ul style="list-style-type: none"> Tiered price and service scales based on willingness to pay Revenues from optical and pharmacy shops 	52
salaUno (Mexico)	<ul style="list-style-type: none"> Tiered price and service scales based on willingness to pay 	70

n.a.=not available

Financial Viability

Grants, loans, and equity investments provide support. The type of financial support depends partly on the legal status of the clinic chain. Chains such as AECS and LVPEI are set up as nonprofit enterprises. salaUno established itself as a for-profit enterprise, partly

to leverage the advantages that such status has to secure finance, such as impact investing. EYE-Q is profit clinic chain that is closely affiliated with the nonprofit Eye-Q Foundation.

Development agencies (such as the Department for International Development and the Canadian Development Fund [DFID]) provide funding to some specialty clinic chains (mostly in the form of grants). Development finance institutions (such as the Inter-American Development Bank and the International Finance Corporation), and impact investors (such as the Acumen Fund), sometimes invest in these chains. National financial support tends to come in exchange for services—that is, through tie-ins with social health insurance schemes or consulting or policy collaborations. salaUno, for example, benefited from the inclusion of its services by Seguro Popular in 2012–13. Established by the government of Mexico, Seguro Popular is a public health insurance that covers a wide range of services without co-pays for its affiliates. Since 2004, Seguro Popular has gradually expanded to include 55.6 million people. PVRI is a long-standing beneficiary of the Sri Rajiv Aarogyasri health insurance scheme in Andhra Pradesh.

The mix of financial tools and legal status may change over the life cycle of a clinic. DFID supports one of the younger clinic chains, the Nairobi Eye Hospital (NEH). The Acumen Fund has invested in established clinic chains (AECS, LVPI).

Some of the more mature models are close to reaching financial sustainability with respect to operating costs. AECS, established in 1976, covers 94 percent of its costs; LVPEI, established in 1987, covers 85 percent. Most of their revenues comes from patient fees for services.

A key feature of successful models is a diversified business model that allows profitable services (such as optical and pharmacy sales, product development, research, surgical tourism) to cross-subsidize loss-making business segments. In general, the clinic chains that are growing fastest are those that have multiple internal revenue streams.

Partnerships

In rural areas, many clinic chains operate spokes that recruit outreach workers from local communities. They support community participation and ownership. PVRI recruits and trains “vision guardians,” who work on a voluntary basis in return for free eye care for their families and consideration for future employment. SalaUno uses a pool of marginalized rural women for outreach. It secured a grant from IDB to train ophthalmic nurses recruited in this manner.

Clinic chains are filling a gap in public healthcare services. Some enterprises actively cooperate with the government to extend service provision. PVRI’s clinics are state accredited and part of the Andhra Pradesh state health insurance scheme. LVPEI and AECS connect with the government through research grants and policy exchange; both chains consult with the national government to replicate their model.

Some of the more mature clinic chains want to preserve their independence from the state. LVPEI has a policy of not accepting government financing for its core business model.

Implementation: Delivering Value to the Poor

Awareness

All chains use extensive community outreach activities to raise awareness. Activities include health talks, health road shows, and use of health educators. To maximize service utilization, these activities occur just before screening camps or mobile clinic visits. Some chains target specific population segments, such as agricultural workers and students. Traditional outreach activities in rural areas are complemented by Internet-based outreach. Increasingly, chains are advertising directly to patients. Many chains cite word-of-mouth as responsible for the majority of their new patients.

salaUno uses social media and Internet platforms, aware that paying patients are increasingly, young, discerning, and literate in information technology (IT). It has also negotiated a pro bono partnership with a public relations agency, which designs direct-to-consumer TV and radio ads that raise awareness of its services. salaUno has incorporated a referral award scheme, called an “ambassador program,” to capitalize on this organic growth through social media. Approximately 60 percent of its new patients are estimated to come through word-of-mouth.

Acceptance

Fear of surgery and loss of eyesight through poor care and bad surgical outcomes are among the main reasons for low uptake of free cataract surgery (Mitsuhiro and others 2014). These fears—not all of them unfounded (BBC 2014)—are most prevalent among rural, less-educated people. Addressing challenges around acceptance and creating community ownership are the main objectives of community outreach and education.

Accessibility

Clinic chains focus on attracting patients from rural areas for whom specialized services were previously inaccessible. They locate hubs outside the major cities, where services are often already available through multispecialty hospitals. They often use the hub-and-spoke design and conduct extensive community outreach. These features extend their service delivery into peri-urban and rural areas and reduce time and travel costs for patients. Where services are not available near a community, many clinic chains provide reimbursement or even transportation.

Affordability

Many clinic chains provide a proportion of their services free to the poorest people. The proportion is determined by its ability to reduce operational expenses, by the values and vision of the enterprise, and by the mix of financing tools used. It ranges from 23 percent of all patients at AECS to 78 percent at PVRI.

AECS depends on funding other than patient revenues for 6 percent of its costs; at PVRI the figure is 10–15 percent. These sources include internal revenue streams such as optical and pharmacy sales, although most extra revenue comes from external financing.

Even when all direct costs (including service fees and transport) are covered, uptake can be low among poor people, because they cannot afford the short-term opportunity costs of undergoing surgery (lost income from missing work, further dependency on family members) and lack support systems (Kovai and others 2014).

Results and Cost-Effectiveness

Scale and Reach

Single-specialty clinic chains have made highly specialized health interventions available to the poor through free service provision, extensive outreach activities, and peri-urban clinics. This model has reached millions of patients, many of them saved from further disability, blindness, and poverty.

Some eye care clinic chains have reached significant scale, with a handful demonstrating international replicability. The number of patients reached ranges from tens of thousands to millions. The hub-and-spoke model correlates the number of patients with the number of clinics, because of the variability in its implementation. Some of the pioneering chains that are now at scale took 20–30 years to achieve their current reach, whereas some of the newer chains (often international replications) are scaling up extremely rapidly. Within two years, for example, salaUno became the top cataract surgery provider in Mexico City, with 21 centers.

Improving Outcomes

Eye care clinic chains reduce the prevalence of avoidable blindness in the areas where they operate. In doing so, it not only improves health, it also increases income. In rural Assam, for example, where weaving and small handicrafts are a primary livelihood, poor vision contributes to loss of income. Since February 2015, ERC Eye Care has treated about 9,000 patients in Assam, performing 350 cataract correction surgeries at its hub hospital.

Successful treatment raises patients' productivity. In addition, by allowing them to maintain or reclaim their economic independence, it makes them less likely to be an economic burden on their family and community and to incur catastrophic health expenditures. An impact evaluation assessment on the provision of eyeglasses to low-income visu-

ally impaired individuals found that it increased their productivity by 35 percent (Karnani and others 2010).

The clinic chains also bring more sustainable employment opportunities to people working within the communities, and they have trained thousands of clinical staff from all over the world. By creating high-level economic opportunities, these chains help prevent the brain drain of specialists.

Cost-Effectiveness

Specialized clinic chains often provide higher-quality care than general clinics at an affordable price. At AECS streamlined procedures reduced the time spent per patient, resulting in an average surgery time of 6 minutes, compared with 21 minutes in the United States. Tasking surgeons with only one operation allows them to perform more surgeries, reducing the cost per operation to USD 40–125. Cost reductions do not come at the expense of quality: AECS has a postoperative infection rate of 0.05 percent compared with a national average of 0.09 percent in the United States.

Clinic chains also reduce costs by producing their own products in their labs. An intra-ocular lens produced in their labs costs USD 13, compared with USD 96 for an international brand (*Ophthalmology Times* 2014).

Scaling Up

Challenges

The main challenge many clinic chains face is recruiting and retaining top physicians. Unable to offer high or competitive remuneration, many chains have adopted innovative approaches to retain qualified staff. LVPEI allows its specialists to devote one-third of their time to research. PVRI has a competitive, donor-funded fellowship program. Some chains have training in-house to overcome human resource challenges and be self-reliant.

Another challenge is maintaining sufficient patient volumes to achieve economies of scale. Competition from multispecialty models targeting peri-urban centers is increasing, and healthcare financing is expanding (India's government aims to reach universal health coverage by 2022), increasing pressure on clinics to partner with other providers or integrate within the health system.

Financing is the most frequent reason for forming a partnership with the government. The majority of financing takes the form of end-user financing through subsidies or, more frequently, acceptance by public insurance schemes.

LVPEI agreed to participate in four pilots with the state government of Andhra Pradesh in India, which will integrate its facilities with public primary healthcare centers. Financial pressures remain, however. The company needs to reduce its operational dependence on external grants and subsidies and secure financing for growth outside of the major urban centers.

Role of Government and Public Policy

Governments can support specialized clinic chains and protect patients by setting up registries and licensure of clinics. Such registries could be used to provide access for national pooled procurement systems (for drugs, commodities, and medical supplies), particularly systems with robust, often international quality assurance certification. Oversight, regulation, and enforcement of private providers and products are needed to protect patient safety.

National governments can help single-specialty clinic chains obtain financing in their first few years. A number of successful, fully scaled examples of this business model serve as proof-of-principle, which could reduce donor risk. Domestic seed funding (e.g., angel financing, royalty-based debt), flexible financing products (e.g., India Inclusive Innovation Fund), and impact investments from domestic philanthropists may be avenues for governments to partner with and encourage and facilitate financial support for specialized clinics. Although a variety of specialized clinics show significant results, validation on the cost-effectiveness of the model is needed to encourage state or national governments to incentivize and disseminate specialized clinics model as a means of using public expenditure more efficiently to achieve better outcomes.

Table 15. Social enterprises: Single-specialty clinics that serve the BoP

<i>Enterprise</i>	<i>Country</i>	<i>Description</i>
Aravind Eye Care Systems	India	Provides high-quality eye care through cost cross-subsidization. www.aravind.org
CCBRT Disability Hospital	Tanzania	Provides surgical and outpatient services for ophthalmology, obstetric fistula, orthopedics, and reconstructive surgery, targeting the lowest-income communities. Subsidizes free or low-cost services by charging higher prices for supplemental services. www.ccbt.or.tz/disability
ERC Eye Care	India	Provides quality, affordable primary and tertiary eye care to the low-income community through a hub-and-spoke model in Assam and other areas of northeast India. www.erceyecare.com
Eye-Q	India	Provides affordable eye care for conditions that do not require overnight stay, using hub-and-spoke model in north and west India. www.eyeqindia.com
HealthCare Global Enterprises Ltd	India, Kenya, Tanzania, Uganda	Operates largest network of oncology hospitals in South Asia. Doctor-led initiative has more than 150 partnering physicians at independent centers that belong to the HealthCare Global network. www.hcgoncology.com
LV Prasad Eye Institute	India	Provides eye care through a pyramid model. Builds on community participation to offer community wide tertiary facilities. Half of services are free for the poor, subsidized by sales from optical and pharmacy shops. www.lvpei.org

Table 15. Social enterprises: Single-specialty clinics that serve the BoP (continued)

<i>Enterprise</i>	<i>Country</i>	<i>Description</i>
Lumbini Eye Institute	Nepal	Provides self-sustaining primary eye care in rural areas through multipronged approaches at the grassroots, district, and zonal levels. www.lei.org.np
Narayana Health	India	Applies principles of assembly line production to cardiac surgery in order to improve productivity and lower costs. Cross-subsidizes services to the poor. Innovates low-cost micro-health insurance scheme. www.narayanahealth.org
Nairobi Eye Hospital	Kenya	Delivers eye care to patients across all income levels. Specializes in treating diabetic retinopathy, a leading cause of visual impairment. www.uheal.or.ke
NephroPlus	India	Provides one-stop shop for kidney care, with focus on dialysis patients and all their needs. www.nephroplus.com
Pushpagiri Health Care Hospitals Pvt. Ltd.	India	Operates two super-specialty hospitals that treat preventable eye diseases at full cost for people who can pay and at a subsidized cost for people who cannot. Runs community screening and outreach programs. www.pvri.org
RG Stone Urology & Laparoscopy Hospital	India	Provides urology services by establishing own clinics, partnering with doctors in Joint Ventures, and establishing department in large clinics. www.rghospitals.com
salaUno	Mexico	Brings affordable high-quality eye care to low-income people through a high-volume/low-cost model achieved through economies of scale in operations and partnerships with corporations and NGOs. www.salauno.com.mx
Sorridents Clínicas Odontológicas	Brazil	Provides accessible, affordable dental care closer to home, typically on the outskirts of large- and mid-sized cities, where most poor people live. Patients include the elderly and people with disabilities. sorridents.com.br

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Challenge

India has the largest number of visually impaired and blind people in the world. An acute shortage of optometrists and donated eyes and the fact that most Indians cannot afford treatment means that millions of people suffer from conditions that are preventable or treatable.

Innovation

The LV Prasad Eye Institute (LVPEI, <http://www.lvpei.org/>) is a nonprofit chain of eye clinics operating primarily in the southern Indian state of Andhra Pradesh. It delivers good-quality eye care, including screenings, cornea transplants, and cataract, glaucoma, and retinal surgeries.

The institute's pyramid model of service delivery and cross-subsidization of patient segments allows it to reach people who are unable to afford care. At the top of the pyramid, LVPEI operates three tertiary care hospitals, conducts research, trains clinicians, maintains an eye bank, offers medical tourism services, engages in policy and advocacy activities, and performs consulting services. At the bottom of the pyramid, its network of 117 vision centers in rural areas refers patients, provides refraction and dispensing services, and screens for blinding diseases.

Each vision center serves as the hub of a network of about 10 "vision guardians," who perform community awareness activities and provide postsurgical care and outreach. These volunteers are recruited, trained, and returned to the communities. In return for their work, they receive free eye care for themselves and their families as well as priority consideration for paid positions with LVPEI. The institute also operates 15 secondary and 127 primary care facilities in remote rural areas in the states of Andhra Pradesh, Karnataka, Odisha, and Telangana.

About half of LVPEI's patients are treated free of charge. The cost of their care is cross-subsidized by fee-paying patients (including growing numbers of international patients) as



well as by revenues generated from other sources, including optical shops and pharmacies and royalties from a contact lens developed through an international research and product development partnership. In addition to free services, LVPEI offers a tiered price and service list, which allows patients to select the most appropriate services they are able and willing to pay for. At the lower tiers, prices are substantially lower than comparable interventions performed at private hospital facilities.

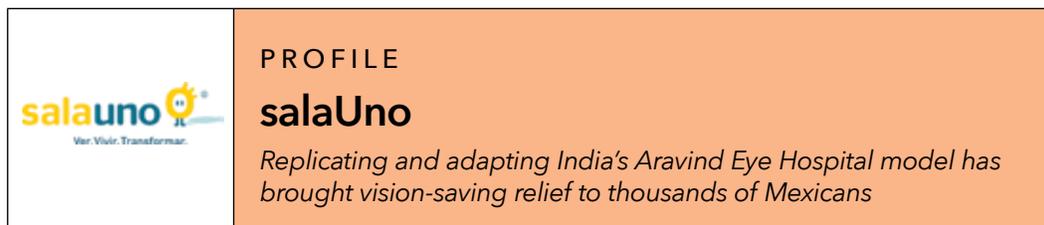
Impact

Since its launch, in 1987, LVPEI has improved the lives of 20 million people in 3,000 villages in India through its comprehensive eye-care and door-to-door services. In 2014–15, 47 percent of all outpatient services as well as 44 percent of surgeries were provided free of charge. LVPEI provided free eye-care services to another 700,000 people and reduced the severity of impairment of 88,000 poor patients.

LVPEI's eye bank—the Ramayamma International Eye Bank (RIEB)—is the largest provider of sight-restoring corneas in India. It has harvested 43,000 donor corneas and transplanted 22,750 of them, more than any other center in the world. LVPEI has also trained 18,000 eye care professionals, 80 percent of them from India; published more than 1,550 research papers; supported 200 national hospitals in 18 states in India; and provided assistance to eye-care facilities in 17 other countries. LVPEI's vision center model has been replicated by the government of Australia, which provided a USD 50 million grant to apply the model in its primary-level development programs in South East Asia and the Pacific Islands.

Scaling Up

The main driver of the model is its ability to be self-reliant on training and retaining staff. Strong community involvement, extensive monitoring and evaluation to continuously optimize operations, and well-balanced government oversight are also critical to the program's success. Resourcing challenges remain, since outside of the major cities, skilled managers and community-based ophthalmologists with the skill and reputation for community acceptance in rural areas are scarce.



Challenge

Eye-related disease is the second-most common type of disability in Mexico, affecting 60 percent of the population (Okhuysen 2013). The country's high prevalence of diabetes, a condition that increases the risk of cataract and diabetic retinopathy by 40 percent, means that the burden of eye disease is likely to remain heavy for years to come.

The public health system in Mexico is unable to meet the demand for care, and private providers are too expensive for 65 percent of the population (Mukesh, Moe, and Bartlett 2013). The combination of heavy demand and limited supply means that the level of unmet medical need is very high. The problem is particularly acute among the rural poor, for whom lack of eye care leads to or deepens poverty.

Innovation

salaUno (the name means "room one," referring to its surgical theater) was founded in 2010 as a for-profit eye care clinic chain, replicating and adapting India's successful Aravind Eye Hospital model. The company's vision is to eliminate needless blindness by bringing affordable, high-quality eye care to lower-income Mexicans through a high-volume, low-cost business model. It does so through economies of scale (salaUno's surgeons perform five times the number of surgeries of an average Mexican ophthalmologist) and the cross-subsidization of poorer patients by wealthier ones. Prices for a check-up range from USD 1.75 to USD 3.50; for cataract surgery, patients can choose from services that range from USD 400 to USD 1,740.

Many of the innovative aspects of the salaUno model resulted from adapting the Aravind model to the Mexican context. For example, Internet connectivity is greater in Mexico than in India, allowing salaUno to use social media platforms such as Facebook to maximize awareness of its services and telemedicine to improve efficiency in patient referral. salaUno



These low-income Mexicans, pictured here with Javier Okhuysen, one of salaUno's founders, received free treatment from the program.

also operates two software subsystems to manage a range of business components, from finances to inventory of its optic stores, and coordinate patient flow and medical records.

salaUno has set up partnerships with private enterprises and NGOs to increase patient capture and referral and make its services affordable. Initially, services were included in the government's health insurance scheme (Seguro Popular), through which salaUno performed 60 percent of its surgeries. That partnership ended in 2013, when the government decided to cover eye care itself. Service provision is currently subsidized through a partnership with Fundación Cinepolis and the establishment of a microloan program.

Impact

salaUno is the leading provider of cataract surgery in Mexico City. Between 2011 and 2014, it served 72,000 people, including performing 7,400 cataract surgeries, treating 10,000 eye ailments, and providing 17,000 free consultations to people at the bottom of the pyramid. In 2015, it performed half of its surgeries free of charge. Studies demonstrate the cost-effectiveness of cataract surgery, with some estimating the financial return on investment to society at 4,567 percent over 13 years (Brown and others 2013).

salaUno is a certified hospital that offers training courses in collaboration with universities. Nurses trained by salaUno can receive a diploma in ophthalmic nursing.

Scaling Up

salaUno replicated and built on the lessons learned from the Aravind model. The strong business case and flattened learning curve facilitated access to equity and debt financing from the Inter-American Development Bank, the International Finance Corporation, and Adobe Capital.

The main driver is the high demand for services. Partnerships with other actors for referrals and the initial inclusion of salaUno in the government's health insurance scheme also contributed to scale-up.

The end of the partnership with the government highlighted the vulnerability of depending on external actors, particularly public ones, and reignited a drive to pursue a sustainable independent business model. It led salaUno to raise its service fees and explore other avenues for subsidizing the free services for patients who cannot cover surgery out-of-pocket. Increased revenue from tiered pricing offering ancillary services has helped offset the greater uncertainty while dealing with government contracts.

The ability to serve large numbers of patients may be a growing challenge, as it was for some of its Indian predecessors, and recruitment and retention of specialized, trained staff is an ongoing challenge. These constraints have been partly mitigated by adding salaUno's own hospital for training of staff and making it a more attractive employer among physicians through the possibility to conduct research.

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Ambulatory Services for the Last Mile

Emergency and medical transportation service delivery for the underserved

HIGHLIGHTS

- Ambulatory enterprises have innovated in product and service design, ensuring that the social aspect of the business does not take away from its sustainability.
- They can operate in difficult terrains, yet manage to provide value for consumers at the last mile.
- These enterprises are changing the healthcare landscape in developing countries by training health workers, making consumers aware of their health care options, and pushing for legislation regulation in uncharted territories.



Summary

Ambulatory social enterprises have found ingenious ways of providing service to the underserved in rural and remote areas by making sure that their services are affordable and accessible. They have adopted innovative business models that focus on the design of the product and are scaling up through strategic partnerships.

Development Challenge

Providing primary and quality healthcare to its citizens is a priority of all countries and it is especially significant in developing countries where healthcare is considered a strong metric of its progress. Many developing countries are increasingly looking to address and implement strong emergency medical care systems to improve the overall health of its cit-

izens. In India, emergency transport service was limited until 2005. Andhra Pradesh began supporting the operations of Emergency Management and Research Institute (EMRI), which operates the emergency number 108 receiving more than 12,000 calls every day. The most common emergencies are pregnancies followed by vehicular trauma incidents, which cluster in the late afternoon and evening. 108 is now operational in 15 Indian states and 2 Union Territories, it operates 7,116 108 EMS Ambulances, with 45,000+ employees.

Ambulatory services are fragmented in developing countries and face significant challenges of funding, inadequate infrastructure, technological barriers, lack of government support, and access to medical supplies, etc. In spite of the risks of sustaining this type of a business model, many social entrepreneurs are venturing to provide these services due to the sheer demand and value of emergency medical care.

Business Model

Social enterprises and entrepreneurs have dedicated years of research to understand how effective ambulatory services can be best organized and implemented in developing countries, in a manner that is cost effective and is able to address the challenges of the local ecosystems. Ambulatory services in different developing countries represent the diversity of their socio-economic realities in the solutions they provide to the local communities.

Components of the Model

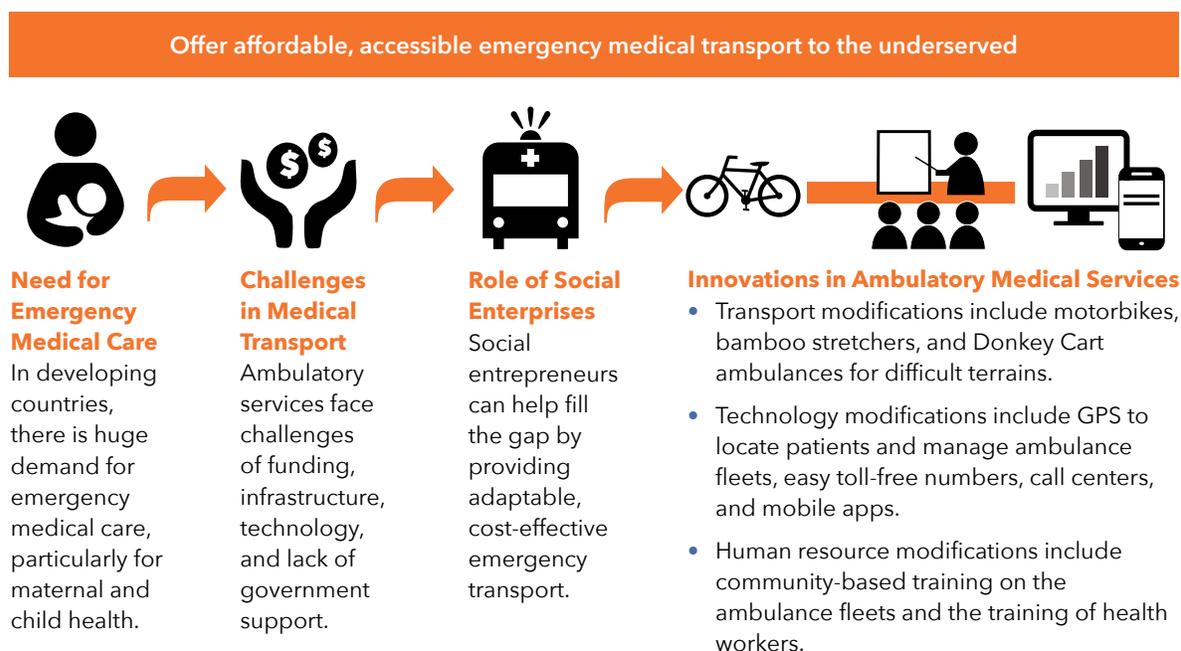
Social enterprises vary in their interventions (figure 9) and use cross-subsidization of services across different demographics or through the help of donors and investors.

Some ambulatory services focus on product design that allows ambulances to transport patients in far-flung places or certain geographic terrains—these are low-cost innovative interventions, such as motorbikes as ambulances or a Bambulance that is a lightweight bamboo stretcher, which can be easily attached to a bike.

Information technology and mobile technologies play an important role in patient-centered care coordination with regards to ambulatory service delivery. Some enterprises use technologically savvy, high-impact interventions that use state-of-the-art call center facilities and mobile apps for easy access by patients, or they use an easy-to-remember emergency call number. More than 4.7 billion people are expected to have mobile phones by 2017. Mobile phones provide direct access to patients, especially in low-income developing countries. GPS technology can locate patients and manage large fleets of ambulances. For example, Dial 1298 ambulances are controlled by a state-of-the-art call center that is available 24 hours a day, 7 days a week that identifies the ambulance closest to an emergency and directs the ambulance team.

Some enterprises have created partnerships to allow for larger impact, while some others focus on the training and deployment of health workers to enhance health outcomes.

Figure 9. Features of the ambulatory services model that can aid health outcomes at the last mile



Cost Factors

Ambulatory services incur most of their capital costs in setting up the infrastructure, designing the service delivery model, developing the product (ambulance), training health workers, managing information services, integrating technologies, and managing supply chains, risks, and operational costs. As a result of all these factors, setting up an ambulatory social enterprise can prove a costly endeavor.

Revenue Streams

Ziqitza's innovative business model has a range of revenue streams that has contributed to its growth and financial success. It is able to operate at scale yet remain inclusive for underserved populations. In Mumbai, 1298 uses a sliding price scale that depends on a customer's ability to pay—the hospital type selected by the patient determines the fee. All accident victims, disaster victims, and unaccompanied victims are transported for free. In other locations, the government subsidizes calls, and in some cases patients also pay a small fee.

Ambulatory services often cross-subsidize based on the type of demographic they serve. This is particularly viable in markets where there is diverse economic stratification. Wealthier patients are charged more and that revenue is used to discount more affordable or free service for lower-income consumers. Rather than maximizing profits, ambulatory social enterprises repurpose their profits to serve larger numbers. Ambulatory services such as 108 have also been able to expand because of public-private partnerships (PPPs) with state governments in India in the form of tenders. Governments serve as an important customer

for both traditional and social businesses, but for ambulatory services, it is a critical means through which they can serve more patients in greatest need of their service.

Ambulatory services have found a creative source of generating revenue by placing corporate logos on their ambulances. Large corporations like to be associated with these social enterprises as part of their corporate social responsibility initiatives, and it keeps the enterprises financially sustainable. It is a win-win for both the traditional and social businesses. In 2007–08, 1298 ambulances generated USD 208,608 in ad revenue. Private health providers also promote their brand using these ambulances, yielding benefits for all stakeholders.

Financial Viability

Many ambulatory services rely on grants or patient capital in the early stages of operations to stay financially viable. International organizations, donors, governments, private companies, or nonprofits, which want to address gaps in emergency medical care or inefficiency in health systems in emerging markets, initially pay for most ambulatory business models. Unlike the consumers, they have an incentive to pay for the application since it is in line with their mission. Ambulatory enterprises also innovate on their product design and service delivery using local solutions and/or technology that helps them increase their operational efficiency, adapt, and remain sustainable. Additionally, ambulatory services have identified revenue streams that make them more viable.

Ambulatory services often employ cross-subsidization. Tebita ambulances have developed a business model based on cross-subsidization. It offers high quality, ISO-certified ambulance service, remote medical assistance, and emergency aid training to multinationals, diplomatic missions, foreign NGOs, and expatriates. Surplus income from those activities subsidizes the cost of a local ambulance service in surrounding provinces. As a result, Tebita can offer ambulance service to the public for an average of USD 15–20, even though the actual cost is USD 51. The costs for lower-income end-users are kept low to encourage uptake. This puts pressure on companies to operate efficiently and at scale, to recover investments and operating costs. Financial returns are received in the form of cost savings and raising awareness rather than the actual paid costs by consumers.

Partnerships

Ambulatory social enterprises create partnerships that benefit them in various ways. Some help them with funding their operations, some support them by training employees and raising awareness among local communities, some help in the design and deployment of the service, and others help them simply scale up their operations. All of these types of partnerships are crucial at various phases as the enterprise grows and matures. 1298 was initially set up in association with the London Ambulance Service, a UK Government Agency, which has provided processes, systems, protocols, training, and project implementation assistance. In other Indian states, 108 Emergency Response services is run either by the government or it is contracted out to other organizations, such as the Emergency Management and Research Institute (EMRI).

EMRI's PPP model leverages pre-existing government infrastructure and resources to provide emergency services to the population for free. The capital and operational costs are paid for by the government in the form of grants, formalized through a memorandum of understanding with each state. EMRI also conducts training programs at its Emergency Medicine Learning Centre, which forms one of the primary sources of revenue for the organization. The technology platform to run the emergency response system is designed and provided pro bono by Indian IT major Tech Mahindra. With this partnership model in place, EMRI has been able to scale the 108 service to cover half of the country, encompassing 15 states and two Union Territories and reaching a population of 750 million.

Implementation: Delivering Value to the Poor

Awareness

Healthcare points of care and health workers play an important role to make patients aware of ambulatory services. Significant marketing efforts have also been used to explain these services, such as conventional advertising, radio, billboards, and community outreach.

Acceptance

Ambulatory services have addressed challenges faced by consumers by keeping the user interface simple and easy-to-understand, even for those with minimal literacy. For example, 108 has a three-digit toll-free number that is easily accessible from landlines and mobile phones. Ambulatory services have also customized solutions for specific demographics, such as pregnant women, patients in hard-to-reach places, etc. Ambulatory services are increasingly being provided by public or private providers, also improving their rates of acceptance. By providing better service in a quick and efficient manner, these enterprises are increasingly being accepted by all stakeholders.

Accessibility

Developing markets have limited healthcare services available, and this is a huge challenge to be resolved for those at the last mile. Ambulatory services have innovated smart product design to make themselves more accessible for these consumers. In places with inadequate infrastructure, organizations such as Motomedics and Zambulance have found local, cost-effective, and simpler solutions for the communities they serve. For example, most rural areas in Africa are unreachable by regular vehicles due to its rough terrain. Bike4Care aims to solve this problem by providing bicycles to health workers. The program also aims to generate income for local health workers by reinvesting a portion of the funds they pay for their bikes into income-generating activities.

Ambulatory services partner with healthcare providers, telecom companies, and government agencies to allow for mechanisms that make it easier to access services. Incentives are made for health workers to educate and encourage patients to use these services.

Ambulatory services allow those who live in remote places to seek medical attention. Many enterprises have invested in state-of-the-art technology, such as call centers, mobile apps, and infrastructure that identify the ambulance closest to an emergency and directs the ambulance team. For example, Dial 1298 ambulances take an average of 10–30 minutes in urban areas and 15–40 minutes in rural areas to reach a patient.

Affordability

Dial 1298 prices are competitive and approximately 10–15 percent cheaper in comparison to the local private ambulance provider. Through the 1298 program, Ziqitza operates a network of fully equipped Advanced and Basic Life Support Ambulances across two states in India. Dial 1298's business model uses a sliding price scale driven by a patient's ability to pay, which is determined by the kind of hospital to which patients choose to be taken. Financial sustainability is assured through cross-subsidization.

Results and Cost-Effectiveness

Scale and Reach

As consumers are made aware of the healthcare options available to them, they are quick to engage with these services and even recommend it to others in their communities. Ambulatory services provide a crucial healthcare service to those in need and with due diligence, good service and effective partnerships, they are able to successfully scale up, reach larger populations and create more impact. Standardizing their operating model also helps them replicate and scale up across geographies in a cost-effective manner.

Ad-din Ambulances in Dhaka is one of the philanthropic projects of the Ad-din Foundation, dedicated to serving the health needs of lower-income women and children. In 2008, they initiated the project with a fleet of 10 ambulances. Less than a year later, the fleet had grown to 46 vehicles, and public interest in the new program increased quickly. In 2011, another 20 vehicles were added to the fleet, bringing the total to 66. Bike4Care in Africa has reported a 258 percent increase in the number of households visited by community health workers since its launch. Bike4Care serves 63,740 households per month, with the average household at seven people. As of October 2012, there were over 500 community health workers trained and equipped with bicycles in Africa. The number of calls 1298 received increased from 11,417 in 2005 to over 40,000 calls in 2010. Dial 1298 for Ambulance has saved more than 70,000 lives in Mumbai alone. Ziqitza currently operates more than 980 Ambulances across five states in India and has served over 2 million people since 2005.

Improving Outcomes

The quality of health people live with in developing countries is directly influenced and determined by the quality of care they receive. 108 ambulance service responds to approximately 23,000 emergencies on a daily basis through a fleet of nearly 10,000 ambulances, making it the largest emergency response service in the world. In 2014, they responded to over 30 million emergencies, saving over 1.2 million lives—one life saved every 30 minutes.

The PPP approach allowed 108 to scale up quickly, and shows the potential of what private providers can do with government resources. EMRI headquarters in India has become a training hub for training of Emergency Medical Technicians (EMTs), a field so new that no licensing exam exists yet in India.

Scaling Up

Challenges

Ambulatory services that cater to the last mile face a multitude of challenges. They often operate in remote places with inadequate infrastructure, and the costs of operation are high and require collaborations with various stakeholders. Additionally, the training and manpower required to run operations is intensive and requires support from healthcare providers and government agencies to be sustainable. In developing markets, regulation and legislation is missing and makes an efficient ambulatory service difficult to sustain with competing interests.

Ethiopia's Tebita ambulance service faces a number of challenges, which includes access to finance. Even though they generate a healthy financial surplus, local banks are hesitant to provide loans, citing a lack of collateral. Impact investors are interested in financing Tebita, but current investment regulations in Ethiopia prevents foreign investors from participating directly in the emergency medical services sector. Another challenge is Tebita's vulnerable supply chain. Their current business license only allows them to import ambulances, not medical supplies, which are not available locally.

Role of Government and Public Policy

Governments in developing countries have an important role to ensure that everyone has access to healthcare systems and especially in cases of emergency. They need to introduce legislation that allows for ambulatory services to establish themselves, seek funding and be operationally sustainable.

Although ambulatory services often have support from foreign and local organizations, potential impediments to successfully scaling these social enterprises includes lack of government support and funding. There is potential to partner with both the public and private sector to expand their reach and impact more last mile consumers. Standardization of poli-

cies, as well as set guidelines for practice, would help implement ambulatory programs by overcoming inter-operability, portability, and legal issues.

Further issues, such as educating the general public on the options available to them, or supporting access to these services by improving basic infrastructure such as roads, telecommunications, etc. are challenges that could be best resolved at a government level.

India's GVK EMRI handles medical, police, and fire emergencies through 1-0-8 Emergency Service. This service is run either by the government or contracted out to other organizations. This is a free service delivered through emergency call response centers that are able to dispatch over 2,600 ambulances across 10 states. EMRI's goal is to respond to 30 million emergencies and save one million lives a year. To that end, 108 Emergency Response Services has signed memorandums of understanding with over 6,800 hospitals, which have agreed to provide initial stabilization of EMRI transported patients for free for the first 24 hours.

Each EMRI ambulance is accompanied by a trained EMT, who is responsible for pre-hospital care while transporting the patient to a hospital for stabilization. If required, the EMT is able to communicate via mobile phone with the in-house Emergency Response Care Physician, who is a qualified medical practitioner, available 24/7 to support the EMT. With the expansion of the fleet and services across more states, GVK EMRI now has over 10,000 ambulances covering a population of over a billion.

Table 16. Social enterprises: Ambulatory services for emerging markets

<i>Company</i>	<i>Country</i>	<i>Description</i>
The Ambulance Project	Kenya	The Ambulance Project offers emergency medical care in a remote region of western Kenya by providing the ambulance to transport patients from their homes to the dispensary.
Ad-din Ambulances	Bangladesh	The Ad-din Hospital established a low-cost ambulance service in 2008 after recognizing that many women in Dhaka were failing to access emergency obstetric care. Using mobile phones and a GPS tracking system, Ad-din manages a fleet of 66 ambulances stationed throughout the city.
Bike4Care	Burkina Faso, Kenya, Uganda	Bike4Care improves access to health care by equipping health workers with bicycles and helping clinics use bicycle ambulances in rural communities.
Bambulance	Kenya, Namibia	Bambulance is developing a medical device that transports people in rural sub-Saharan Africa to a hospital or clinic. It combines common forms of transportation with a means of safely and comfortably transporting people.
Donkey Cart Ambulances	Kenya, Afghanistan	Moving pregnant women across vast and sandy pastures to the nearest health facility in a hot, arid climate is difficult and dangerous. Care for the Mother project provides donkey carts as ambulances for transporting women in labor to local clinics.
GVK EMRI	India	GVK EMRI is an emergency transport and response model that is delivered through a PPP with state governments. It is provided either free or through user fees as mandated by the contract with the participating state government.
Motomedics	Vietnam	MotoMedics is a social enterprise founded to improve emergency medical response in Hanoi, Vietnam. Trained first responders on motorbikes are able to reach patients quicker and deliver them to the hospital in far less time than traditional ambulances.
Riders for Health	Gambia, Uganda, Lesotho, Ghana, Nigeria, Zambia, Zimbabwe, Kenya, Malawi, Tanzania	Riders for Health is an international nonprofit social enterprise that manages vehicles used for health care delivery by partner organizations. They manage 1,300 vehicles across sub-Saharan Africa.
Tebita Ambulance	Ethiopia	Tebita Ambulance and Pre-Hospital Emergency Services provide emergency ambulatory services, pre-hospital medical services, first aid training for non-health professionals, and emergency training for health professionals.
Zambulance	Uganda, Zambia	The Zambulance, manufactured by Zambikes, connects rural African villages to critical medical care. It is a trailer that can be easily attached to either a bicycle or motorbike. The innovative design provides the patient with an affordable and comfortable solution for emergency transportation to health centers in rural areas.
Ziqitza Healthcare Ltd	India	ZHL operates 24/7 call centers with ambulance tracking systems through an easy to remember four-digit telephone number (1298). Their ambulances are equipped with personnel trained in basic and advanced life support. A sliding scale fee is used based on the customer's ability to pay, and is determined by their hospital selection.



Changing the Lives of Women and Girls through Affordable Feminine Hygiene Products

Low-cost products save lives, reduce school and work absenteeism, and increase the incomes of women at the bottom of the pyramid

HIGHLIGHTS

- Social enterprises are producing and selling good-quality sanitary products at affordable prices.
- Manufacturing sanitary pads in rural and remote areas, using locally available raw materials, widens reach and reduces costs.
- Women are involved in every stage of the value chain, often producing and selling pads themselves.



Summary

Women and girls who use unhygienic alternatives for sanitary pads or tampons (such as newspapers, leaves, cloth, and cow dung) not only face health issues, but also tend to miss work or school more frequently. Indeed, most women in developing countries, particularly in Asia-Pacific and Sub-Saharan Africa, do not use adequate female hygiene products. This lack of use negatively affects their self-esteem and participation in education and employment and ultimately, in society.

Social enterprises have responded by developing low-cost methods of sanitary pad production coupled with innovative models for distribution and marketing. Women at the Bottom of the Pyramid (BoP) are included at all stages of the value chain—as entrepreneurs or employees in production, distributors, health educators, and consumers.

Development Challenge

Only a small fraction of women in developing countries use sanitary products during menstruation. Most make do with newspapers, leaves, pieces of cloth, cow dung, and other materials, which cause chafing, urinary tract infections, reproductive tract infections, and other reproductive health problems, including fatal toxic shock syndrome and infertility (Boosey and Wilson 2013; UNICEF 2009). Lack of sanitary products also causes girls to stay home from school and women to miss work. A third of Ugandan schoolgirls cite lack of pads as the reason for missing school (Crofts and Fisher 2012). Nextbillion (2013) estimates that lack of access to sanitary products causes low-income women to lose an average of five years of lifetime wages. Inadequate menstrual hygiene also prevents girls and women from performing other activities and engaging with others (Montgomery and others 2012).

The market for feminine hygiene products is huge. In India alone, where more than 300 million women do not use adequate sanitary products, it is estimated to be worth more than USD 200 million (AC Nielsen 2011; Economist 2013). The challenge is to make products affordable and convince women and girls to use them.

Business Model

Components of the Model

Social enterprises and NGOs produce both sanitary products and simple machines that allow women in villages to produce sanitary pads. Manufacturers of sanitary products (mostly pads) procure the raw materials, produce the products, and organize distribution (figure 10).

Manufacturers of machines (Aakar Innovation, Jayaashree Industries [JI], and Saathi) produce the machines, identify women's groups interested in becoming microentrepreneurs, and provide training and in some cases assistance in financing the purchase of the machine. Women's groups purchase the machines; organize the production process; purchase raw materials; share knowledge about menstrual hygiene; engage in word-of-mouth advertisement; and sell pads door to door, from home, or back to the machine vendor for sale to consumers. Although this model requires a large upfront investment, it generates a constant revenue stream for rural women.

Many non-state actors train health educators and organize awareness campaigns.

Cost Factors

Sanitary products sell for USD 0.03–0.16 apiece—30–80 percent less than brand-name products. The per item cost is higher for reusable products (e.g., AFRIPads reusable pads cost USD 4–5 per 4-pack) than for disposable products, but the annual cost is only about 20 percent.

Figure 10. Feminine Hygiene Products Business Model



Pad-producing machines can cost USD 500–1,500 plus installation and training. Raw materials used in production (papyrus, banana trunk fiber, bamboo, water-hyacinth pulp) are often locally available.

Revenue Streams

Enterprises selling production machines generate revenue from selling the machines. Saathi, an Indian company, supplements these revenues by selling banana fiber to women’s groups using their machines. Aakar, another Indian enterprise, buys sanitary pads from women’s groups and sells them at a profit, generating additional income for the social enterprise.

Micro-entrepreneurs generate monthly profits of USD 50–100 (Sandhana 2012). Both JI and Saathi report that women’s groups earn an average profit of USD 400 a month (CNBC 2014; New Inventions n.d).

Donors and investors provide funding, ranging from start-up grants to investments. Technology for Tomorrow (T4T) received a USD 78,000 two-year research and development award from GIZ and the Rockefeller Foundation (Adelphi 2013). Other enterprises (Saathi, SHE, T4T) have won financial awards in business competitions. Afri-Can received seed

funding from the US Agency for International Development (USAID) and crowd-funding through Indiegogo.

Financial Viability

Both JI and T4T report that they are profitable. T4T reported earning USD 300,000. It sells 90 percent of its pads to the United Nations High Commissioner for Refugees (UNHCR), which distributes them to refugees in Uganda (University of Oxford Humanitarian Innovation Project 2013).

Partnerships

Half of the social enterprises work with partner organizations to accelerate distribution. T4T distributes its MakaPads through UNHCR. Azadi, AFRIpads, Ruby Cup, One Girl, and JI use partners to identify women's groups in local areas. Others sell pads to international NGOs for their redistribution.

Implementation: Delivering Value to the Poor

Awareness

Many girls and women lack adequate knowledge of reproductive health in general and menstrual hygiene in particular, leaving them susceptible to myths and misconceptions (Garg, Goyal, and Gupta 2012). To fill this gap, female sales agents, teachers, and community health workers working for or with social enterprises provide education at informal knowledge sharing sessions, formal workshop, schools, and village meetings. Afri-Can employs teachers as sales agents, training them to educate schoolgirls on menstrual hygiene; it also organizes school health clubs. AFRIpads uses radio to disseminate information about hygiene and raise awareness about its product. Azadi operates a toll-free menstrual helpline to provide information to girls. Ruby Cup sells its product only after a female mentor explains how it is used. Sustainable Health Enterprises (SHE) operates menstrual health and management clubs run by teachers at 10 schools.

Acceptance

Cultural taboos reduce acceptance of feminine hygiene products. Reusable pads need to be dried in the sun and are thus visible to others, which is taboo in many places (Women's Global Toolkit 2013). In Kenya, for example, a father is not allowed to see his daughter's blood. Tampons are often considered taboo, because some cultures ban on inserting foreign objects into the body (Crofts and Fisher 2012). However, in some places where water sup-

plies may be more limited, menstrual cups have been successfully promoted and adopted, as they require less water to clean than reusable pads and one cup can last for many years.

To enhance acceptance, enterprises adapt products and packaging to customers' needs and wants, sell them in kits, distribute them through locally trusted partners, and create local brands. A number of businesses conducted trials and studies to understand consumer preferences before beginning production. Product adaptations that resulted from these efforts included adding a string that attaches the pad to the body for users who wear no underwear.

To encourage adoption of their reusable pads, some companies sell them in kits that contain soap, a holder, underpants, bags for used pads, and instructions in local languages.

Most products are produced and distributed locally, often by local women's groups or community health workers. Many women's groups create their own brands, identifying pads with local production and allowing for a culture-specific approach.

Enterprises address cultural taboos through community events involving both men and women. Programs at the village level include awareness sessions and plays to destigmatize taboo subjects. Employing salespeople who are sensitive, empathetic and trusted by the target group facilitates uptake (Economist 2013).

Accessibility

Without the efforts of social enterprises, many women would lack access to products because the market is dominated by multinationals, whose distribution networks are limited in rural areas (*Inclusive Business* n.d.). Social enterprises ensure accessibility through local production, which minimizes transport requirements; door-to-door sales; and distribution through schools and humanitarian organizations, such as UNHCR. Many distribution models circumnavigate outlets dominated by men, because women are more comfortable buying sanitary products from other women (Price 2014).

Door-to-door sales are the most common form of distribution. About half of business models also distribute products in schools. In Sierra Leone, One Girl distributes pads for free; Afri-Can, SHE, and Impact Africa sell their products to schoolgirls. In India 126 machines produced by JI have been installed in schools. Schoolgirls invest in raw materials and produce the pads, which they sell to other students and community members at a profit. SHE sells its pads through community health workers.

Affordability

Low-income customers can afford the products, because enterprises keep costs low, through a short supply chain, the elimination of middlemen, local production, use of local inputs, and avoidance of marketing costs. Flexible payment also facilitates affordability. JI accepts barter and late payment for its machines, as do women selling JI pads to other women in rural areas. One Girl sells packs with as few as two pads to women with insufficient cash flow (table 18).

Table 17. Selling points and prices of selected social enterprises selling feminine hygiene products

<i>Model/country</i>	<i>Product type</i>	<i>Selling points</i>	<i>Price</i>
Aakar Innovation (India)	Production machine	Shops, sales agents	Machine: USD 6,800 Pads: 40 percent less than brand-name products
Afri-Can Trust (Kenya) I-Care pads	Reusable pad	Schools, shops	Around USD 2.50 for a package that lasts a year (45 percent less than least expensive product).
AFRIpads (Uganda)	Reusable pad	Sales agents, partner organizations	USD 4-5 per pack. AFRIpads Deluxe Menstrual Kit has a set of 4 reusable sanitary pads, plus 1 storage bag. (20 percent of the cost of brand-name products)
Azadi (India)	Compostable, biodegradable pad	Partner organizations, sales agents	USD 0.04 a piece (43 percent less than brand-name products)
Impact Africa (Kenya, Rwanda, South Sudan, Tanzania, Uganda) (Safi Pads)	Reusable pad	Selling points in informal settlements, schools	Half the cost of brand-name products
Jayaashree Industries (India)	Production machine	Sales agents, schools	Machine: USD 1,500 Pads: USD 0.03 apiece (80 percent less than brand-name brands)
One Girl (Sierra Leone) (Pads provided by Technology for Tomorrow)	Compostable, biodegradable pads	Sales agents, schools, partner organizations	Free in schools, USD 0.68 per pack (of 10 pads)
Technology for Tomorrow (Uganda, exports to Sierra Leone)	Compostable, biodegradable pad	Partner organization, sales agents	USD 0.41-0.82 for a pack of 10 pads (one-third the cost of brand-name products)
Ruby Cup (Kenya, South Africa, Uganda, Zambia)	Reusable cup	Sales agents, partner organizations	USD 0.11-0.16 apiece through sales agents in Kenya, USD 30 online and in shops in Germany
Saathi Healthcare (India)	Production machine	Sales agents	Machine: USD 500 Pads: USD 0.03 apiece
Sustainable Health Enterprises (SHE) (Rwanda)	Compostable, biodegradable pad	Sales agents (community health workers), schools	USD 0.03 apiece (30 percent less than imported brand-name products)

Production machines are made affordable by selling to women’s groups rather than individuals. Machines are typically manual, avoiding dependence on electricity.

Results and Cost-Effectiveness

Scale and Reach

The number of people enterprises reach ranges from 1,200 (One Girl) to about 7.5 million (JI) (table 18). JI is the most mature model; it has been replicated in 17 countries through the export of machines and the dissemination of information on its model. AFRIPads is the second-most mature model, with a reach of 500,000 women. Afri-Can Trust has educated some 30,000 girls in menstrual hygiene management at 290 schools. Four of the 11 social enterprises studied are expanding (Impact Africa, JI, Ruby Cup, T4T).

Many models target the rural poor, though some models cater to the poor in urban areas. A few target specific groups. Afri-Can targets low-income working women; Aakar Innovation targets urban areas, selling products in grocery shops and beauty parlors; and Ruby Cup focuses on slum areas.

Improving Outcomes

Feminine hygiene products reduce health risks, such as reproductive tract infections which can lead to infertility and other child birth complications.

Table 18. Number of women and girls reached by selected providers of feminine hygiene products

<i>Enterprise/country</i>	<i>Number of women and girls receiving product</i>
Afri-Can Trust (Kenya)	35,000
AFRIPads (Uganda)	500,000
Azadi (India)	300 villages
Impact Africa (Kenya, Rwanda, South Sudan, Tanzania, Uganda)	125,000
Jayaashree Industries (India)	7.5 million
One Girl (Sierra Leone)	1,200
Ruby Cup (Kenya, South Africa, Uganda, Zambia)	5,000
Saathi Healthcare (India)	About 12,500 (in five villages)
Technology for Tomorrow (T4T) (Uganda, exports to Sierra Leone)	34,000

These products also increase school attendance. Following the introduction of its pads, Afri-Can Trust reported a 40 percent increase in school attendance for 30,000 girls across 250 schools in Western Kenya. Sanitary pads and menstrual hygiene education reduced absenteeism among schoolgirls in Ghana from 21 percent to 9 percent (Montgomery and others 2012). Girls also reported greater confidence and self-esteem, more participation in chores and everyday activities, less shame and isolation, and improved well-being during menstruation.

Women's productivity at home and at work rises when they have access to feminine hygiene products. In the absence of access to hygiene products, 300 million girls and women in rural India have to stay confined at home during their periods. An average woman living in poverty, loses five years of unearned wages over her lifetime due to ineffective menstruation options—income that could otherwise be put towards health care, education or food expenses. (Nextbillion 2013). In a survey conducted in 9 cities in India, around 31 percent women reported a drop in productivity levels during their periods, missing 2.2 days of work on an average. (AC Nielsen 2011).

Production and sale of products also generates employment, mostly for women. Some 21,000 female micro-entrepreneurs worldwide produce and sell sanitary pads using the machines JI produces. T4T employs 250 people, most of them from vulnerable groups, including women at the bottom of the pyramid, people with HIV, and refugees. Sanitary pad production also generates income for local farmers, who see increased demand for papyrus, banana trunk fiber, bamboo, and water hyacinth pulp. Women also work as sales agents and educators.

A 2011 study estimated that access to sanitary products by all women in India could increase India's economic growth rate by 4 percentage points (AC Nielsen 2011). In Rwanda, SHE estimates that 18 percent of girls and women missed out on school and work last year because they could not afford to buy menstrual pads, these absences can add up to considerable potential GDP losses (SHE n.d.).

Cost-Effectiveness

Most models are profit-oriented. Some serve the bottom of the pyramid by cross-subsidizing sales. Ruby Cup, for example, is a silicone product that can be used for up to 10 years, eliminating the need for some 12,000 tampons or pads. The company charges just USD 0.11–0.16 per cup in developing countries, subsidizing these sales by charging about USD 30 for its product online and in shops in Germany (Emma 2014).

Scaling Up

Scaling up is possible, thanks to cost-effective, standardized production using locally available materials. JI's simple and open source technology has led to the model's adoption in 18 countries. Partnerships with women's groups and other actors, such as local businesses, NGOs, and governments, can also facilitate growth and replication.

Media attention can be a powerful driver of success. JI's founder, Arunachalam Muruganatham, spent years developing a machine that enabled rural women to produce affordable

sanitary pads. Once his story became popularized in India, support by partners and demand from women's groups and customers increased, leading to international fame, including a documentary (<http://www.menstrualman.com/>).

Challenges

Several constraints risk limiting growth and impact. Inadequate sanitation facilities, particularly at schools, are a major impediment to growth: Even with access to sanitary pads, girls may stay home from school if there are no toilet facilities with running water, where they can replace the pad or wash in privacy. Sanitation facilities in Uganda are often unsuitable for changing pads, because toilets (pit latrines) are located separately from the bathing blocks where water is available for washing. Moving between the toilets and washing blocks is inconvenient for girl students as this impacts their privacy since others can notice that they are on their period. (Crofts and Fisher 2012). A study in Tamil Nadu, India, found that the main causes of school absenteeism were lack of water (89 percent) and privacy (50 percent) for washing (Jothy and Kalaiselvi 2012).

Disposal of sanitary products is another important issue, both from a waste management and a cultural perspective. In Uganda 65 percent of girls throw disposable pads into pit latrines, causing blockages; the pads also cause the latrines to fill up more quickly (Bharadwaj and Patkas 2004; Crofts and Fisher 2012).

Some models, such as Aakar Innovation, Azadi, One Girl, and T4T, produce compostable products made from papyrus leaves, which disintegrate within a year in pit toilets. T4T also sells incinerators of different sizes to schools and health facilities. Compostable or reusable products partly address the environmental issue.

Lack of privacy creates shame, particularly given cultural taboos, which prevent girls and women from washing a reusable cloth in a public space, such as school. Drying reusable products in the sun is also difficult. In a Ugandan study, 79 percent of girls reported drying their sanitary pads in their bedrooms (Crofts and Fisher 2012).

The belief that local products are inferior to imported ones also limits uptake. Ugandan schoolgirls prefer commercially produced disposable pads because of their lighter weight, greater absorbency, and lower likelihood of leakage; they also liked the "modern" image of imported products (Crofts and Fisher 2012).

Combining the sale of sanitary products with menstrual hygiene education and information is key to addressing some of these constraints, particularly cultural taboos and misconceptions. It has the power to erode taboos and break down gender barriers more generally.

Role of Government and Public Policy

Both donors and recipient governments have begun to address menstrual hygiene as a key issue in women's health and girls' education. International institutions such as the World Bank, UNESCO, UNICEF, the World Health Organization (WHO), and others have started including menstrual hygiene management, including the provision of sanitary products, in their research and support to governments. Including menstrual hygiene in

Table 19. Social enterprises: Providers of feminine hygiene products

<i>Enterprise</i>	<i>Country</i>	<i>Description</i>
Aakar Innovation Pvt. Ltd.	India	Produces and distributes affordable, high-quality, compostable sanitary napkins and raises awareness of menstrual hygiene. www.aakarinnovations.com
AFRIpads Ltd.	Uganda	Manufactures and sells washable cloth sanitary pads. www.afripads.com
Afri-Can Trust	Kenya	Produces high-quality, affordable, reusable sanitary pads and provides practical life enhancement training that equips women and girls to live freely and take charge of their lives. Product can be used for up to a year. www.icarepads.com
Azadi	India	Developed a 100-percent biodegradable sanitary napkin that is 43 percent less expensive than average retail price. Enterprise also operates a toll-free menstrual helpline, sponsors a 'menstrual-friendly schools' initiative, and supports an "Azadi Instigators" program in which trained outreach team members deliver empowering puberty education sessions to low-income youth. www.azadi.co.in
Impact Africa	Kenya, Rwanda, South Sudan, Tanzania, Uganda	Provides affordable sanitary kits that include inexpensive, reusable, washable sanitary pads. www.impactafricaindustries.com
Jayaashree Industries	India and 17 other countries	Company founded by Arunachalam Muruganantham produces world's first low-cost machine to produce sanitary pads. More than 600 machines have been installed in 27 states in India and 17 other countries. Machines are sold directly to rural women's self-help groups through the support of bank loans and not-for-profit organizations. Machine operator can learn the entire pad-making process in three hours and employ three others to help with processing and distribution. www.newinventions.in
Miriam Seba	Ethiopia	Produced in Ethiopia, Miriam Seba makes environmentally friendly, low cost, reusable pads that last 12-18 months. Made of cotton with water proof lining to prevent leaks. Produces about 600,000 pads per year. www.dignityperiod.org
One Girl	Sierra Leone	Delivers affordable, biodegradable sanitary pads, through network of female entrepreneurs and school systems. www.onegirl.org.au/what-we-do/launchpad
Ruby Cup	Kenya, Zambia, South Africa, Uganda	Partners with NGO networks across Africa to distribute silicone menstrual cup that can be used for 10 years. Subsidizes distribution in Africa with sales in Europe. www.ruby-cup.com
Saathi Healthcare Private Ltd.	India	Developed small-scale manufacturing process to produce affordable sanitary protection from banana tree fiber waste. Pads are manufactured and sold by local women. www.saathipads.com/

Table 19. Social enterprises: Providers of feminine hygiene products (continued)

<i>Enterprise</i>	<i>Country</i>	<i>Description</i>
SHE (Sustainable Health Enterprises)	Rwanda	Helps women jumpstart social enterprises to manufacture and distribute affordable menstrual pads. www.sheinnovates.com
Technology for Tomorrow (T4T)	Uganda, exports to Sierra Leone	Produces MakaPad, a sanitary napkin made of papyrus and paper waste, that is manufactured in Uganda without the use of electricity. Company also sells special incinerators to dispose of nonbiodegradable waste in schools, clinics, and hospitals. www.t4tafrica.co/home

national sanitation and hygiene strategies and school health policies is an important step toward improving awareness of feminine hygiene products. Also critical is ensuring that toilet facilities with running water and sanitary pad disposal facilities are available to girls (UNICEF 2012).

Recognizing the importance of sanitary products, several governments have started subsidizing pads or making them available for free. In 2010, the government of India initiated the Menstrual Hygiene Scheme, which provides highly subsidized sanitary pads to rural girls living below the poverty line. State governments followed suit with similar initiatives. In 2011, the government of Kenya allocated almost USD 4 million to provide free sanitary napkins to schoolgirls; it committed an additional USD 2 million in 2014 (*East African Business Week* 2014; *Pacific Standard* 2014).

Cutting taxes is another way governments can facilitate access to sanitary products. In 2011 Kenya stopped levying duties on imported pads, a move that reduced their cost by 18 percent (*New Internationalist* 2013).

Facilitating knowledge sharing and discussion is another way in which governments can play a role. In 2014, the Ugandan government supported the first national conference on menstrual hygiene management, which sought to break the silence on menstruation and keep girls in school. AFRIPads took on the role of national coordinator of Menstrual Hygiene Day. Together with partners, it presented a menstrual hygiene management charter to the speaker of Parliament to raise awareness about the need to include menstrual hygiene management in health and education policies.

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 <p>JAYAASHREE INDUSTRIES New Inventions. For Better Living.</p>	<p>PROFILE</p> <h2>Jayashree Industries</h2> <p><i>Female microentrepreneurs produce and sell pads, bringing sanitary hygiene to women and girls in villages</i></p>
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Challenge

Of the 355 million women of reproductive age in India in 2011, 88 percent (312 million) did not use sanitary pads, resorting instead to unhygienic alternatives, such as ashes, newspaper, sand, husks, and dried leaves to manage blood flow during menstruation (Khan and Gokhale 2013). Such alternatives increase the risk of reproductive tract infections by 70 percent (Sinha 2011). Poor menstrual hygiene is also associated with cervical cancer, the second most common cancer among Indian women (Institut Català d’Oncologia 2014).

Lack of sanitary pads has also been linked to poor school attendance and drop-out. According to a 2011 study by AC Nielsen, 23 percent of girls in India drop out of school after they start menstruating (30 percent in Northern India) (Sinha 2011). Girls who remain in school miss about five days a month, equivalent to 20 percent of the school year. Women miss work for the same reason. The benefits of providing women and girls with sanitary pads are thus enormous.

Innovation

Jayaashree Industries (JI, newinventions.in) developed the world’s first local sanitary pad production machine. The business is based on a women-to-women model. Groups of 4–10 women acquire a machine, which they use to produce pads they sell to other women. Home sale enables women’s groups to create awareness and allows for an intimate information exchange on menstrual hygiene in an environment that facilitates privacy.

JI has set up 2,300 manual or semi-automated machines in India. Each machine can produce 1,000–3,000 pads a day, using locally available pine wood fiber or other absorbent materials, such as bamboo fiber. Purchase of a machine—including installation and training—costs USD 2,300–3,800. The women finance their purchases through self-help group loans, loans from NGOs, banks, investment organizations, and government social schemes.



These microentrepreneurs—pictured here with company founder Arunachalam Muruganantham—produce and sell sanitary pads in their villages.

Ji empowers women and gives them a sense of ownership by having them choose their own brand names. Since the sanitary pads are marketed only locally, through word of mouth, the benefits of creating a local product outweigh the creating a national brand.

The Earn While You Learn project installed 126 machines in schools. Schoolgirls who purchase the required raw material produce the pads for their own use and sell their surplus production in nearby villages. Corporate social responsibility programs or wealthy donors paid for the machines.

Impact

India has about 2,300 machines, each supplying about 3,000 customers. Thus, the program provides 6.9 million girls and women with access to sanitary pads.

It also has significant economic and social impact. Its 21,000 rural microentrepreneurs earn USD 46–99 a month—two to three times what the average farm worker earns and two to four times the poverty line of USD 15 a month (Singh 2014).

Ji reinvests all profits from the sale of machines in the business. It increased its production capacity 50-fold in the 11 years since its founding.

Scaling Up

Ji benefits from the dynamism of its founder, Arunachalam Muruganatham, one of *Time* magazine's 100 Most Influential People in the World in 2014. His mission is to create one million employment opportunities and convert India to a country with 100 percent sanitary pad use.

The company's decentralized model facilitates horizontal expansion and deep penetration into rural areas. Local production also has the advantage of cutting transportation and storage costs (processed material requires 10 times more storage space than unprocessed material). Uptake of the product has been reinforced by setting up machines in schools—not least because young girls are more receptive than older women to using sanitary pads and often convince others to do so as well.

Cultural taboos associated with menstruation make it challenging to reach women in rural areas. Considerable time is required to receive community permission to talk to women and dissipate their doubts about the product. Installing the machines and training people to operate the time takes time. Market development is slow, and producer groups often face limited economic viability.

Ji has received requests from several other countries, including Botswana and Côte d'Ivoire, for assistance in replicating the model. Although the company holds a patent on the machine, it provides open access to the model, facilitating replication. To date, more than 250 machines have been sent to 17 countries, improving the lives of an estimated 750,000 people.

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	<p>PROFILE</p> <h2>Technology for Tomorrow Limited</h2> <p><i>Inexpensive, locally produced pads are providing women with safe, clean sanitary care and providing disadvantaged people with jobs</i></p>
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Challenge

Lack of sanitary pads is a major problem in Africa, where millions of girls and women have no choice but to resort to unhygienic and inadequate alternatives, such as newspaper, old rugs, and ashes, which cause chafing and reproductive tract infections. One out of 10 African schoolgirls does not attend school during menstruation (UNESCO 2014), and women lose five years of unearned wages during a lifetime because of work absences during menstruation (Nextbillion 2013). One of the biggest unserved populations is female refugees, millions of whom lack access to pads.

Innovation

Technology for Tomorrow Limited (T4T), based at Makerere University in Kampala, has developed several products to support low-income communities. Its Maka (Menstruation, Administration, Knowledge, and Affordability) sanitary pads are made of local papyrus and paper waste provided from shredded recycled paper provided by the United Nations High Commissioner for Refugees (UNHCR). The four factories that produce the pads employ marginalized groups, including people living with HIV, refugees, abductees of the Lord's Resistance Army, and economically disadvantaged women in Kampala.

A 10-pad packs costs USD 0.41–0.54, about 50–75 percent less than commercially available products. The pads disintegrate in a pit latrine within a year, overcoming the problem of waste. The little electricity need to produce them can be generated by a solar panel.

UNHCR distributes about 90 percent of all MakaPads, distributing them in Ugandan refugee camps. T4T also produces pads for two NGOs, One School at a Time in Uganda and One Girl in Sierra Leone.

In addition to the pads, T4T has developed special incinerators for the disposable of degradable waste that function without wood or electricity. They have been installed at schools, hospitals, and clinics.

Impact

MakaPads have improved the health and quality of life of 55,000 refugees in Uganda, increased female school attendance, and reduced the environmental damage caused by sanitary pads. T4T has also created livelihood opportunities for about 250 people from vulnerable groups, including 65 refugees in its factory at the Kyaka II camp. Employees earn up to USD 200 a month.

Scaling Up

T4T has grown over the past few years. Most of its growth has been from bulk orders from UNHCR, but the business has also expanded to Sierra Leone via One Girl.

T4T plans to expand further by strengthening direct distribution in rural areas via sales agents. It is also considering expanding to Kenya, Sudan, and the Democratic Republic of the Congo, all countries in which UNHCR has expressed an interest in setting up factories in refugee camps.

T4T earns a profit, which it keeps low in order to achieve its social goals. The company is very vulnerable, however, as 90 percent of its sales come from a single customer (UNHCR). Efforts to diversify the customer base have only slowly been yielding results. The Ugandan Ministry of Education declined to partner with the company, despite a successful pilot in 12 schools. The perception in Uganda that local products are inferior to imported ones also constrains growth.

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Using Mobile Technology Tools to Provide Quality Low-Cost Health Services

mHealth helps make healthcare more efficient and effective, by better connecting patients with doctors and healthcare workers and disseminating medical information

HIGHLIGHTS

- Mobile technology connects doctors or healthcare workers with patients—particularly those living in rural and remote areas who often lack access to licensed doctors and specialists.
- Mobile technology creates awareness and disseminates knowledge on prevention, diagnosis, and treatment of medical issues on a wide scale.
- Innovative partnerships between telecoms, NGOs, government, pharmaceutical companies, and other players make health messages quicker and easier to spread.



Summary

mHealth is the provision of health services and information via mobile technology (World Health Organization 2011). mHealth is a powerful tool to make health services more efficient and effective, improving the health outcomes for any person with access to a mobile device. Mobile technology tools can create access to specialized healthcare providers, medical information, diagnosis, and treatment.

Development Challenge

Across the developing world, poor physical infrastructure development has created barriers to healthcare, financial, and other basic services for many of the poorest communities.

While many low- and middle-income countries do not have developed roads or physical infrastructure, many have made advancements in mobile phone and other communications infrastructure reach and coverage.

Business Model

Mobile technology has been a breakthrough innovation in the developing world, revolutionizing how people access banking services, pay for their household energy, and, most recently, how they access health services. mHealth is the provision of health services and information via mobile technology. mHealth is a powerful tool to make health services more efficient and effective, improving the health outcomes for any person with access to a mobile device.

mHealth services can either be applied as part of a standalone business model, or plugged into existing business models and processes. Massachusetts-based Dimagi is a social enterprise that offers mHealth solutions for both types of business models. CommCare is a mobile application used by client-facing community health workers (CHWs) that is designed for data collection, decision support, and behavior change communication. CommConnect is a solution for building SMS applications, allowing for two-way messaging, reminders, surveys, and broadcasts between patients and their caretakers. It can, for example, be used to remind CHWs when their clients are due for services—or to help patients to comply with taking their medication.

Components of the Model

mHealth services can be used for a variety of purposes, which can largely be clustered into five groups:

- **Gather information**—e.g., monitor patients or disease outbreaks and trends
- **Raise awareness and change behavior of patients and/or healthcare providers**—e.g., around misuse or improper use of drugs (adherence)
- **Manage supply chains**—e.g., to prevent stock-outs
- **Improve efficiency and productivity of administrative processes**—e.g., by creating electronic patient records
- **Make diagnosis and advice available**—e.g., in remote areas that lack specialists

Partnerships

A conglomerate of partners interested in improving health outcomes on a broad scale most often implement mHealth solutions (figure 11). A local presence is also critical, as clinics, healthcare providers, or CHWs are the key users and/or points of dissemination of mHealth solutions.

Figure 11. Features of the mHealth solutions model

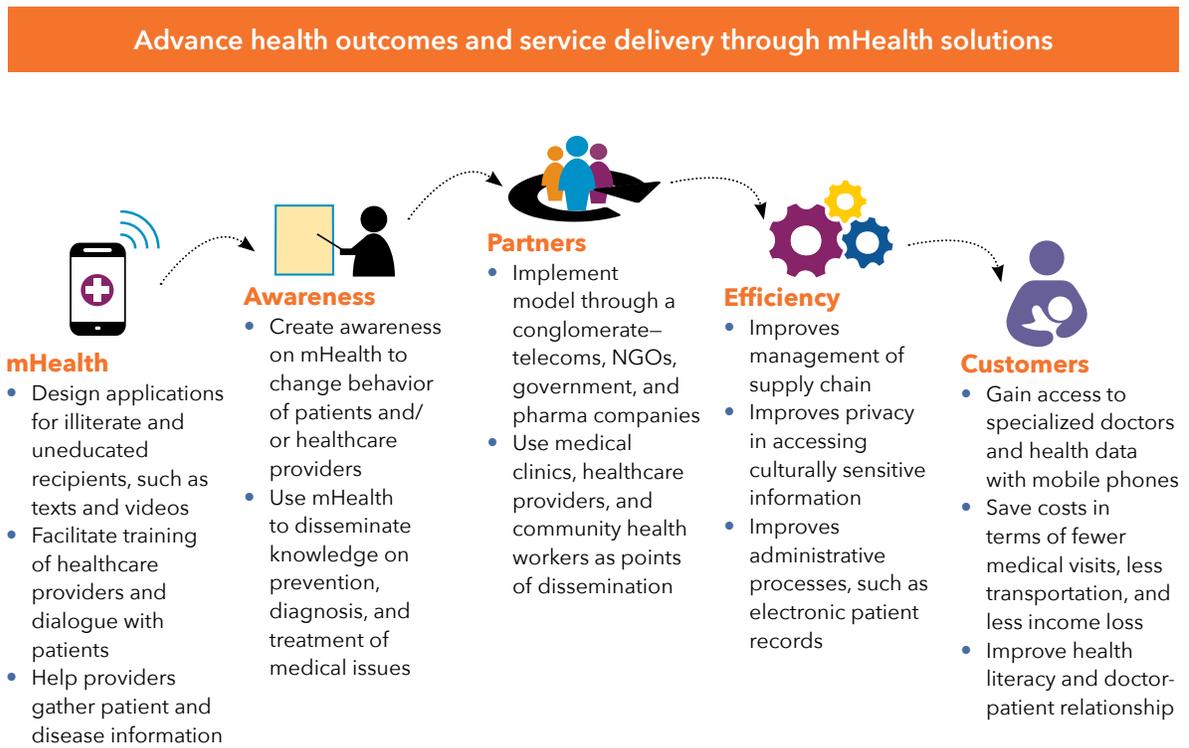
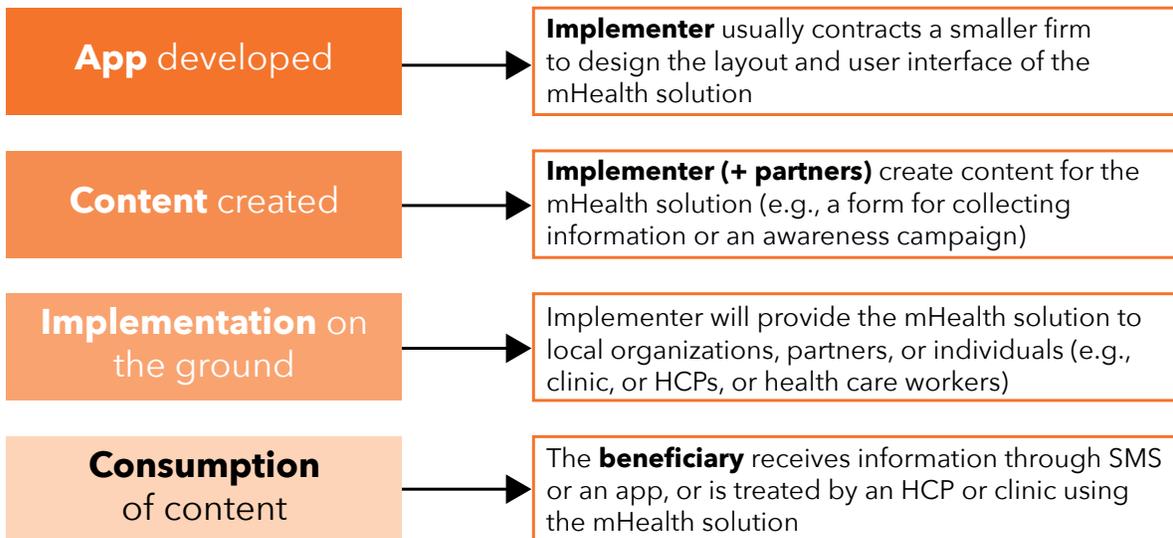


Figure 12. Partners and their roles in the mHealth solutions model



Not only is information and communications technology (ICT) infrastructure (e.g., a developer and a mobile service provider) needed, but also an organization that provides the content (e.g., a nonprofit, governmental organization, or company). To ensure proper

implementation, many mHealth models also need health personnel on the ground (e.g., community health workers).

Developer of the application: Today, most websites, mobile applications (“apps”), and other technologies are built on existing open source platforms, which are much more efficient than every organization building their own platforms from scratch. An open source program uses source code that is available to the general public for use and/or modification from its original design free of charge. In mHealth, a company or organization creates an open source platform. Often, the open source platform can be applied widely, and mHealth is one of many possible uses for the platform. Dimagi’s CommConnect, as previously mentioned, is one such solution.

Implementer: A nonprofit, public sector organization or company who will implement the mHealth solution on the open source platform is responsible for building on it to make it useful and acceptable to the target market through design and content. The implementing actor is also often responsible for creating a go-to-market strategy for the solution—deciding how and when to provide the mHealth solution to the end users. For example, Text to Change’s SMS for Health program in Uganda incentivizes mobile phone users (e.g., with free airtime) to use its SMS quizzes that challenge them on their health knowledge, refer them to HIV testing sites, and gather sex and age data from participants. The company works with a highly popular Ugandan radio channels to spread awareness messages.

Mobile service provider: Mobile service providers usually handle the infrastructure and provide fair prices for scaled solutions. In most cases, they offer a discount to the implementing partner and technical support, especially for large-scale SMS programs. For example, Vodafone was crucial as a mobile service provider partner in Novartis’s SMS for Life program, and ZAIN helped SMS for Life in Uganda with discounted messaging rates. Also, Text to Change benefited from cooperating with leading African mobile providers (including ZAIN), according to Asoka. Service providers also have an incentive to develop new revenue streams through diversified applications and service portfolios

Beneficiaries: Direct beneficiaries of the app are usually patients or healthcare providers in the field. In some cases, the mHealth solution is targeted at and paid for by patients since it provides a clear added value and cost savings. In most cases, where patients are counseled or advised, however, it is crucial to have a healthcare provider such as a physician, nurse, or CHW. TulaSalud, for example, improves the flow of information between CHWs and specialized doctors based in hospitals. In remote villages, they can call a doctor for diagnostic or referral support and collect information about each patient consultation using Magpi. mHealth can also be targeted at healthcare providers interested in improving their knowledge or skills through mobile education and training.

Implementation: Delivering Value to the Poor

Health systems in emerging and developing markets are constrained by gaps and inefficiencies that translate into poor health outcomes for patients, particularly those living at the BoP. These gaps and inefficiencies can be addressed by mHealth. The way value is delivered varies with the different purposes of mHealth solutions.

Awareness

Awareness of the mHealth solution can be a constraint when traditional marketing and information dissemination channels are lacking. Healthcare providers or trusted CHWs play an important role to make the patients aware of the apps. In some cases, the mobile service provider may provide assistance by pushing the mHealth solution to its subscribers.

Acceptance

Often, patients lack awareness on conditions, symptoms or even preventive measures. mHealth applications that aim to address these challenges are particularly designed for illiterate and uneducated recipients. mHealth solutions can be as simple as an SMS broadcast system, for example, which requires minimal digital literacy and only basic feature phones. Traditional illiteracy, another challenge, can be addressed by use of visuals or videos in the mHealth solution. In areas where video coverage is not realistic, voicemail has proved an interesting way to address traditional illiteracy.

Accessibility

In Africa alone, 502 million people have access to mobile phones (Groupe Speciale Mobile Association 2013). What they often lack is access to original drugs or specialized doctors. mHealth solutions address these issues. For example, MeraDoctor helps those who live far away from a clinic or doctor to get access to remote consultations. SMS for Life is an application that aims to prevent stock-outs of drugs in pharmacies. Sproxil helps patients to detect counterfeits.

Affordability

In a few cases, mHealth solutions are provided at an affordable rate and the beneficiary appreciates the service since it saves them costs in terms of fewer doctor visits, less transportation, and less income loss from taking time out to travel for a doctor's visit. In cases where

the intent is to raise awareness, provide knowledge, and/or create behavior change, the actual beneficiary of the mHealth solutions—mostly patients, but also healthcare providers or pharmacists—lack incentives to pay for it. Hence, the solution is often provided and/or paid for by third parties, such as nonprofit organizations or governments. By providing mHealth, they can address inefficiencies and gaps in the health system—tasks that are in line with the mission and work of these organizations (see the section on “Who pays?”).

Results and Cost-Effectiveness

mHealth interventions are well suited for difficult conditions where field workers or beneficiaries face large distances, poor roads, or other barriers to reaching supervisors or health facilities. Many low- and middle-income countries have developed mobile phone infrastructure but limited road and other physical infrastructure. While these conditions make the use of mobile technology essential, they also make rigorous documentation and impact evaluation difficult. There is a need to prioritize and add mHealth interventions that further add to the evidence base of this innovation and document results of successful programs.

Scale and Reach

mHealth solutions are becoming increasingly available since it becomes simpler to create them and mobile phone penetration continues to rise. Many pilot projects have been successful and been converted into a regular part of health interventions. MeraDoctor, based in India, has provided 50,000 consultations via a Whatsapp-like chat app that connects its users directly with doctors. Sproxil has provided over 16 million verifications on prescription drugs, preventing many cases of counterfeits. Being easy-to-use and finding a simple solution to a problem with a high pain point for pharmaceutical companies was critical in Sproxil achieving impressive scale. World Vision, a UK-based nonprofit, has mHealth projects, mostly in the area of maternal and child health, in 14 countries across Africa and Asia. It has reached 2,000 community health workers and 177,000 community members.

mHealth programs are, in technical terms, easy to scale to several thousand people as long as partners commit to the project. However, a major constraint is creating awareness of the app or mHealth solution especially where digital literacy is new. Training is involved to varying extents depending on the mHealth model. In some cases, healthcare workers are required to learn a completely new technology and adjust to it, so this should be taken into account when speaking of scale.

The key drivers for the model include:

- ***Proven cost-saving measures and benefits*** for companies, governments, healthcare providers, and patients have been a driver for the uptake of mHealth models. Good health outcomes on an individual level, combined with quick scaling, have made mHealth models popular.
- ***Good consumer-grade technology and infrastructure***, wherein mobile phones and cellular subscriptions are increasingly available and affordable in developing coun-

tries. Most countries have a mobile cellular subscription rate of over 50 percent, with many countries having reached 70 percent or even above 100 percent, according to World Bank Development Indicators.

- ***New user interfaces*** have made using digital devices more intuitive than ever, enhancing learning outcomes or information collection. Training, for example, can be accomplished more quickly when a trainee can swipe left on a tablet rather than carrying around copies of learning material or having to learn programs on a traditional computer. There are also more open-source platforms available than ever before, meaning that payers only have to modify existing technology for their target group rather than creating a costly solution from scratch, making the cost-saving aspect even more clear.
- ***High pain points and frustration*** with operational inefficiencies in health systems are keenly felt in nearly every country, but particularly in low-income settings. Very high levels of counterfeit drugs were such a pain point for pharmaceutical companies, which mHealth was able to address in a simple and scalable way.

Improving Outcomes

Initial evidence shows that mHealth interventions are successful in health programs that promote behavior change, increasing access and adherence to treatment supply chain and stock management, and as a job aid to frontline health workers. In several programs in Africa, mHealth tools have increased demand for HIV counseling and testing, increased links to care for people with HIV, and improved adherence to anti-retroviral therapy (Catalani et al 2103; Horvath). mHealth has also improved adherence to malaria treatment, uptake and demand for maternal health services (Higgs et al 2014), and reduced maternal mortality by providing traditional birth attendants with a triage tool (Tamrat & Kachnowski 2012). mHealth interventions have also been successful in helping individuals quit smoking (Donner & Mechael 2012).

In support to CHWs, mHealth tools are effective for data collection and reporting, training and decision support, emergency referrals, and work planning through alerts and reminders (Agarwal 2015). These tools are also effective for supervisors, lowering the time required to enter and respond to data and improving communications with workers (Agarwal 2015). mHealth tools have been shown to reduce the time required to monitor program data by up to 66 percent (Medhi et al 2012). National surveillance systems also benefit from mHealth-enabled data collection, improving the accuracy and timeliness of reported data and indicators (Brinkel et al 2014). In addition to frontline worker support, mHealth is effective in managing stocks and supplies, preventing stock-outs and improving the efficiency of supply chains (Aranda-Jan 2014).

Cost-Effectiveness

Create awareness at scale in a cost-effective way: mHealth provides a social impact improving health outcomes in countries with limited resources. In 2012, countries such as

Bangladesh found that they would have to bring down the prevalence of tuberculosis (TB) per 100,000 people by 60 percent to meet Millennium Development Goal targets, which meant a significant outlay of resources. Indus Hospital in Pakistan used an SMS program to raise awareness on TB among health workers in their communities. Health workers who successfully identified individuals to be screened were given mobile money or data top ups as an incentive. The initiative led to a dramatic increase in reported TB cases, which more than doubled during the six months following its launch. Such solutions can be replicated to achieve similar impact.

A survey of mHealth solutions in 12 countries found that life expectancy could be raised significantly as a result of reduced peri-natal and maternal mortality if mHealth was to be widely deployed. For example, this could result in two years being added to the average life expectancy in India and Bangladesh and three years in Pakistan. In regional trials in Pakistan, maternal mortality was cut by 26 percent through the use of mHealth education and information dissemination (Boston Consulting Group 2012).

Providing remote diagnosis to reduce hospital costs, including transport: Remote diagnosis is another area that can result in significant socioeconomic benefit through reduced hospital costs. In Bangladesh, these savings could amount to USD 1 billion a year, or 5 percent of 2025 expenditure; in India, the sum could be USD 7 billion, or 2 percent of 2025 expenditure; while in Pakistan savings are estimated at USD 1 billion, or 4 percent of 2025 expenditure (Boston Consulting Group 2012).

Increased speed and accuracy, as well as cost savings, in collecting and aggregating health data: A pilot project in Guatemala in 2010 showed that the use of Magpi (also known as Datadyne's Episurveyor)—a mobile data collection tool funded by the United Nations Foundation, the Vodafone Foundation, and a World Bank Development Marketplace Grant—not only resulted in drastically increased speed and accuracy, but compared to the 2009 paper-based survey, the mobile phone-based equivalent cut the average cost of data collection and digitization by approximately 71 percent (Schuster & Perez Brito 2011).

These are only a few examples of the ways that mHealth can provide impressive socioeconomic benefit to every actor involved in a health system—the possibilities are nearly limitless given the flexibility of the solution to be adapted and changed according to the market it will be applied to.

Costs to beneficiaries: There are only a few cases in which individuals are likely to pay for mHealth services. One example is MeraDoctor, where the patient has a clear benefit to pay for at-home diagnosis of less severe conditions since it saves him/her time and resources to visit a doctor. Even in MeraDoctor's case, the company found that a "freemium" model worked best—providing users with basic support and consultations via SMS for free, and charging small fees for premium services such as specialist consultations and video conferences. The freemium model has not yet been implemented so exact pricing information is not available (based on a 2015 interview with Gautam Ivatury, MeraDoctor co-founder).

In most cases, the target group of mHealth solutions—be it patients, healthcare providers, or pharmacists—are unlikely to pay individually. The reasons behind that vary with the purpose the mHealth solution was designed for. Patients, for example, often do not know

Table 20. Comparison of end-user costs across mHealth model

<i>Example</i>	<i>End-user costs</i>
Text to Change	None—No charge to receive messages as service has been zero-rated by partner telecom companies
Sproxil	None—Pharmaceutical companies pay for stickers to be placed on items
Magpi (formerly Datadyne)	None to those taking the survey. For the organization conducting the survey, plans range from free (for 20 forms and limited uploads per year) to USD 500, USD 5,000, or USD 10,000 per year depending on the amount of forms and support required.
Meradoctor	None for basic services (consultations for up to 6 people per device via chat). Freemium model will be introduced, in which premium features, such as specialist consultations and video conferences, will incur a small fee.

Source: Hystra 2014.

about certain conditions, symptoms or treatment options—and hence are unlikely to pay for such information. They are also unlikely to pay for applications that help them to adhere to a treatment, since they often skip taking their medicine or visiting a doctor to avoid the payment for it, not knowing about the consequences. Healthcare providers, on the other hand, may be reluctant to pay for training, since they would not be able to charge higher prices for their services or get a higher salary.

Hence, there are only few mHealth providers that sell their services for a profit or even at cost directly to the beneficiaries. Most models are run and paid for by international organizations, donors, governments, companies (such as pharmaceutical companies or medical device manufacturers), or nonprofits that have an interest in addressing a gap or inefficiency in the health system. Unlike the end-users, they do have an incentive to pay for the application since it is in line with accomplishing their mission, and because they often benefit from efficiency gains—or their work can simply be delivered in a more cost-effective manner.

The social enterprise Text to Change, for example, sells its services to organizations ranging from private companies such as Merck or Unilever to public organizations such as GIZ and DFID. Sproxil provides a clear benefit for pharmaceutical companies through its inexpensive way of checking drugs for authenticity. Codes that instantly authenticate a medicine are placed on the pack. Since counterfeit drugs can be ineffective or even harmful to patients, pharmaceutical companies have a strong interest in making sure patients do not consume them, especially since these may damage their reputation or result in patients staying away from their drug or even brand.

It must also be noted that many mHealth models have failed when third parties have backed out (too early) taking away crucial funding. There must be a clear incentive (public health benefit, for example) for the funder to be willing to support the project financially on an ongoing basis.

In terms of financial returns, the return reaped from the implementation of a mHealth program is often in cost savings and awareness building rather than costs paid by the end-

user. Organizations may pay service providers to set up a mHealth program for them that results in a better-informed target group.

Scaling Up

Challenges

- **Regulation is lagging behind the technology.** Regulators need to understand mHealth issues to create effective regulation. For mHealth to be widely used and trusted, it is necessary to put in place regulation that provides sufficient consumer protection—and ensure its enforcement.
- **Possible high upfront costs to creating an app can put off many potential mHealth implementers.** Many mHealth interventions require higher capital outlay at the beginning to set up partnerships, develop the technology, and create content; however, once these are in place, economies of scale can be achieved quickly.
- **Digital literacy is still a constraint.** This makes it necessary to tailor a mHealth solution carefully to its target market. Also, constraints regarding the BoP's ability to access and apply information need to be taken into account, e.g., some people have a phone but no credit to use it or must share with another family member (Panir 2011). Hence, need-based development of solutions is crucial, which is often neglected and leads to discontinued projects (Scott & Mars 2015).
- **Lack of evidence is still high due to many small-scale projects and lack of rigorous follow-up.** Although studies exist, they are mostly small scale and/or only provide anecdotal evidence. To improve existing solutions, as well as to scale and replicate them, evidence is needed on what works (Bastawrous & Armstrong 2013).
- **Creation of roles and alignment of incentives for all partners involved.** mHealth applications are usually “plugged” into existing business models to make those more efficient or effective. They therefore often rely on a complex set of partners, ranging from content and mobile service providers to healthcare workers and ultimately the beneficiaries. Only those models that have managed to create clear roles for all partners involved are successful and can align incentives for everybody to stay on board.

Role of Government and Public Policy

Governments can play two major roles in mHealth. They can set up and enact appropriate regulation and/or use and implement mHealth solutions themselves to provide positive health outcomes for their populaces.

Driving appropriate regulation: The implications of not having the necessary clear legal safeguards in place in the countries may have an adverse impact on the development of mHealth initiatives. Since mHealth services are very new and innovative solutions, policy-makers often lack a clear understanding of how they work, the risks these solutions have

for patients (e.g., when storing and transferring data), and importantly, the benefits. This impedes their ability to know what and how to regulate. On the other hand, patients are vulnerable and thus need to be protected from services that don't meet quality standards (e.g., health advice by people that lack proper training) or disclosing data that is too private. Striking this balance is a major challenge for policy makers.

Being an implementer: Governments can make use of mHealth solutions to improve public health outcomes. They can both make the provision of healthcare more efficient (e.g., when connecting rural healthcare facilities to urban facilities for specialist advice—or facilitate data transfer between facilities), but also relay important public health information in a quick and targeted way (e.g., for educational messaging or to monitor disease outbreaks). Governments will often use or commission a mHealth solution when there are clear public health benefits and it is less cost intensive than the next-best option.

Table 21. Social enterprises: mHealth solutions

<i>Company</i>	<i>Country</i>	<i>Description</i>
CommCare	USA, India, South Africa	CommCare is an open-source mobile health platform used by CHWs to store and access patient information and monitor at-risk patients, while also enabling healthcare program staff to monitor health workers' performance through online reports.
MeraDoctor	India	MeraDoctor mass-markets access to qualified medical health consultations through a well-known messaging platform.
Novartis SMS for Life	Tanzania, Ghana, Kenya, Congo	SMS for life uses a combination of mobile phones, SMS messages, the Internet and electronic mapping technology to track weekly stock levels at public health facilities.
Project Mwana	Zambia, Malawi	Project Mwana is composed of two related initiatives: Results 160, focusing on accelerating the transmission of lab results for early infant diagnosis of HIV/AIDS; and Remind Me, a patient tracking system that notifies CHWs to check up on mothers and infants. Both make use of mobile networks and SMS technology as a support tool to link CHWs to the formal health system to coordinate and measure children receiving treatment.
Sproxil	USA, Nigeria, Ghana (serving West Africa), Kenya (serving East Africa), India	SMS-based code system empowers consumers to check the authenticity of their products
Text to Change	20 countries globally	Text to Change has created a platform that uses SMS as well as locally used channels (like radio) to raise awareness on illnesses. This is a platform that any organization can use and modify as needed for a project.
TRACnet	Rwanda	The TRACnet system uses mobile phones to improve communication between remote HIV/AIDS clinics and administrative centers. This allows health officials to follow individual HIV/AIDS patients and aggregate national data on the epidemic.
TulaSalud	Guatemala	Using mobile phones, TulaSalud has been able to improve the flow of information between health professionals based in hospitals and CHWs, or telefacilitadores, in remote villages. With the mobile phones, the CHWs could call a doctor for diagnostic or referral support and collect information about each patient consultation using DataDyne's EpiSurveyor.

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	<p>PROFILE</p> <h2>MeraDoctor</h2> <p><i>New mobile app connects patients with well-trained doctors via easy-to-use messaging system</i></p>
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Challenge

India's public healthcare system is severely underfunded. Hospitals and clinics are overcrowded, and coverage in rural areas is inadequate. Faced with these problems, many Indians seek treatment with "traditional" doctors, who lack proper medical training and often misdiagnose patients. Millions of patients end up overspending, paying for unnecessary and ineffective treatment of conditions that trained physicians could easily diagnose and treat.

Lack of good-quality affordable health care is an enormous problem in India. In rural areas 7 percent of household expenditure goes to healthcare, and 63 million people a year slip below the poverty line as a result of catastrophic health expenditure (Indian Ministry of Health and Family Welfare 2014).

Innovation

MeraDoctor (<http://www.meradoctor.com>) aims to make qualified medical health consultations accessible to people across India. In order to build a large user base, it currently offers its service completely free of charge.

The first version of its business model was a phone-based subscription model, accessible 24 hours a day. The terms of service were clear: MeraDoctor did not prescribe drugs over the phone, and it referred patients who might have serious conditions to a hospital or specialist. They could choose subscription packages ranging from one month to one year, which included accident and hospitalization insurance.

Soon after launching its phone service, MeraDoctor realized that the way Indians communicate was shifting from voice calls to messaging. Whatsapp has more than 70 million customers in India (*Times of India* 2014). Piloting its messaging service via Whatsapp allowed patients to send X-rays or a picture of their skin rather than describe



This cardiologist is conducting a remote pre-op consultation with a patient.

the problem over the phone. Following its success with Whatsapp, MeraDoctor released its own Android app.

Impact

MeraDoctor handles 800–1,000 chats and 300–400 new consults a day. It has provided more than 55,000 virtual consults on more than 400 ailments. Patients also remain engaged with the app, sending more than 20 messages to MeraDoctor a month on average per patient.

MeraDoctor has given many people first-time access to licensed doctors. It provides patients with accurate diagnoses and advice on how to prevent disease and get better when they are sick, along with information on prescriptions and follow-up care. It reduces health care costs, including transportation and unnecessary medication.

MeraDoctor is piloting a “health diaries” research project to assess its socioeconomic impact. It is also collecting data to compare MeraDoctor outcomes with other healthcare options.

Scaling Up

MeraDoctor works closely with its network of more than 1,400 partners, including doctors, laboratories, hospitals, and insurers to create a trusted brand. It constantly iterates the

product to make it more effective, affordable, and easy to use, making frequent changes to the app based on customer feedback.

The company is building customer traction as quickly as possible, aiming for a wide adoption of its services by users. Its user base could be valuable for health-related service and product providers by providing data and feedback.

MeraDoctor is not yet a profitable business model (it currently charges no fees). Eventually, it will offer premium services that may cross-finance its base service. Its large user base could also potentially be used to provide health-related content (to create awareness for prevention, as a platform for targeted advertisement of nonprescription pharmaceuticals or medical products) or for market research.

The company is working with partners to address issues specific to India, such as the rise of chronic disease. It is partnering with Vital Health Software, co-founded by the Mayo Clinic and Noaber Foundation, to develop a suite of digital health programs on chronic disease for India.

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	<p>PROFILE</p> <h2>Text to Change</h2> <p><i>Pregnant women and new mothers in Tanzania receive phone messages that help them take care of themselves and their infants</i></p>
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Challenge

Lack of understanding of how to prevent disease, when to see a doctor, and why antenatal checkups and adherence to treatment are important raises health care costs and causes unnecessary absenteeism, sickness, and death among low-income populations in developing countries. On a typical day in Tanzania, for example, 21 pregnant women and 108 infants die. Healthy behavior early in pregnancy could avoid many of the problems that lead to these deaths.

Innovation

Text to Change (<http://www.ttcmobile.com/>) a for-profit company based in Amsterdam, is seeking to increase health awareness through mHealth, with the goal of providing low-income people with the information they need to make good decisions about their health. One of its flagship projects is the Healthy Pregnancy, Healthy Baby Text Messaging Service. Under this initiative, pregnant women, mothers with newborns up to 16 weeks old, and their supporters (partners, friends, and relatives) in Tanzania receive free personalized text messages. Recipients are asked to provide personal information, such as their name and due date. This information is then used to send relevant personal messages at the right time in a pregnancy or early childhood. The program is promoted nationwide through the Wazazi Nipendeni (Parents Love Me) campaign, which raises awareness of it through television, radio, and printed materials.

Impact

More than 700,000 Tanzanians have registered for the program, receiving more than 40 million informative safe motherhood messages and reminders. Some 1,300 healthcare



Villagers in Tanzania read health-related text messages sent by Text to Change.

workers in 35 Tanzanian districts have registered more than 14,000 pregnant women. Healthy Pregnancy, Healthy Baby plans to work with 700 more community health workers to inform them of the service and have them register women.

Scaling Up

The company's first interactive SMS campaign, launched in February 2008, aimed to create awareness about HIV/AIDS and to prompt people to get tested. The campaign, implemented in Uganda, reached 15,000 people. Since then, Text to Change has implemented more than 100 projects in 20 countries in Africa, Latin America, and Asia, ranging from agriculture and education to economic development.

Prospects for expansion of services are good within Tanzania, where at least 85 percent of the population uses a mobile phone at least once a week. Millions of people are thus potential users of the service.

Healthy Pregnancy, Healthy Baby involves a wide range of partners, all of whom have indicated ongoing commitment to the initiative. On-the-ground partners are driving awareness of service, with midwives, whom women trust, registering patients as soon as they come in for their first check-up. Local radio channels and television networks are raising awareness of the service.

Text to Change has combined health-related messages with SMS-based agriculture programs that provide information to farmers on weather patterns and how to grow crops. It also works with SMS-based programs of large employers, such as sugar factories and breweries. Along with messages on meetings and other company information, employees receive targeted health messages, informing them about HIV testing or the importance of bed nets, for example.

Gaining the trust of users requires investment in marketing to create a trusted brand as well as a partner network that explains and supports the service. For example, Text to Change often encourages patients to go to clinics. If the clinic is not open, not clean, or out of medicines, patients lose trust not only in the clinic but in Text to Change's messages as a whole. The varying quality of local clinics is thus a concern.

Most mobile operators realize that mHealth could be an interesting model. However, they have not yet figured how to monetize their involvement and therefore often do not get involved.

SECTORAL BUSINESS MODELS

ENERGY



Bringing Solar Home Systems to Off-Grid Communities

Affordable products and innovative financing are improving people's lives and powering small businesses

HIGHLIGHTS

- Innovative financing options—including pay-as-you-go and rent-to-own models—increase affordability.
- The wide range of products and prices increases take-up.
- Use of systems increases evening study hours, reduces fuel collection time, improves health, increases security, gives people more time for socializing and entertainment, and increases savings.
- The systems create jobs for and increase the incomes of the people who sell, install, and service them.



Summary

Millions of people in rural and remote areas of low-income countries are not connected to the electric grid. They use kerosene, biomass, and other sources of fuel that are expensive, unhealthy, and unsafe. Solar home systems (SHSs) are an affordable and environmentally friendly solution for providing off-grid populations with electricity. Innovative payment models increase the affordability of the systems by people with low incomes.

Development Challenge

Some 1.3 billion people live without access to electricity, and another 1 billion have extremely unreliable access. Lack of ready access forces them to use kerosene lanterns and battery-powered flashlights for light, as well as charcoal, firewood, and candles. These alter-

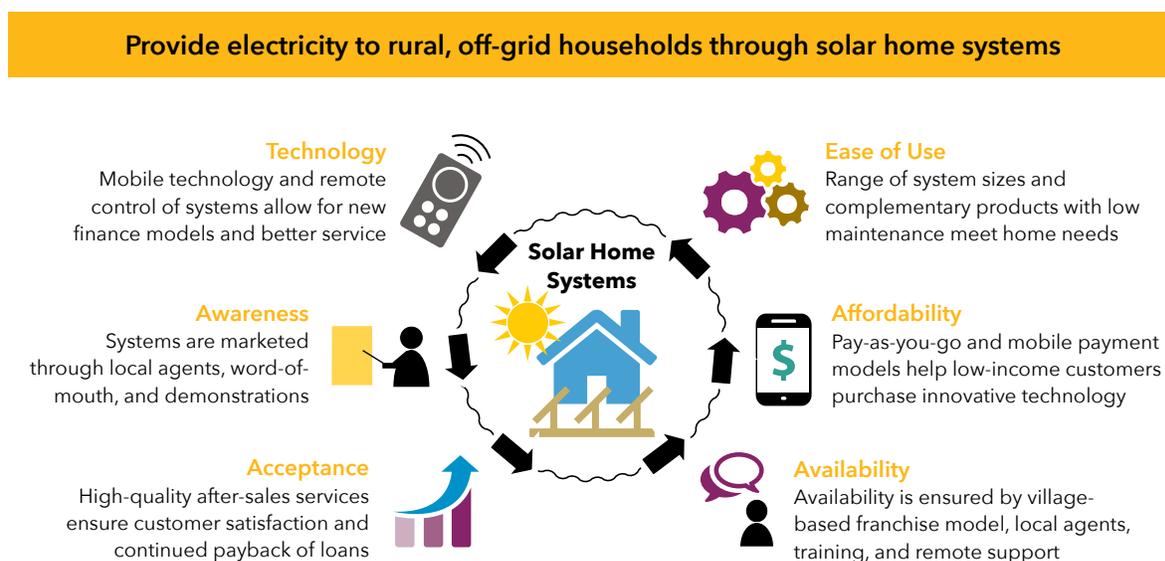
natives are not only inefficient, hazardous and expensive, they also generate pollution and cause serious health and environmental problems. In India 75 million rural households are not connected to the electrical power grid and another 80 million are underserved by electrical utilities. In Africa some 630 million people and more than 10 million small businesses are not connected to the grid (IFC 2014). Effective clean-energy solutions exist, but they require significant upfront costs that often make them unaffordable. Clean but affordable energy is needed to bring power to low-income customers using a decentralized and flexible payment system.

Business Model

Components of the Model

A solar home system (SHS) is a small-scale, autonomous source of electricity for households, offices, or businesses that are off-grid or have unreliable access to energy. It typically consists of a solar panel; a battery set, which stores the electricity; and a charge controller, which protects the battery from overcharging. The battery is charged during day hours, and energy is stored to power appliances during the night. System sizes range from 20W to more than 300W. SHSs generate direct current (DC) that can be used to power a range of electrical appliances, including lights, mobile phones, USB chargers, small televisions, radios, fans, and refrigerators. Some companies, such as BGET in Thailand and Kingo Energy in Guatemala, are also developing alternating current (AC) systems, which allow people to plug in their appliances. The target consumer group for these systems is households with

Figure 13. Model of affordable solar home systems



some capital and income who can afford to pay USD 5–50 a month. Properly designed and installed systems operate without supervision and require only minor routine maintenance by end-users.

Cost Factors

A good-quality SHS sells for USD 200–400. It typically includes a solar panel, battery, charge controller, three or four lighting points, a mobile phone charging port, and power for charging or powering small DC devices. An SHS is an expensive purchase, but companies offer payment options that create regular revenue streams.

Revenue Streams

Customers can pay for the SHS itself in installments, or they can buy only the power generated or used, through a fee-for-service or pay-as-you-go model. Use of mobile payments greatly facilitates the adoption of SHS, by making payments easier for the user and lowering the costs of collection.

Financial Viability

Most companies are either for-profit businesses or use a hybrid business model in which more expensive products cross-subsidize products for low-income customers. Some for-profit business models are financially viable (Sunlabob) or in the process of becoming so (Mobisol, ONergy).

One of the markets that has seen better penetration of SHS is Bangladesh, where in some villages almost 30 percent of the population owns an SHS. However, this also poses a challenge for SHS providers since a growing number of players are competing in a comparatively saturated market.

Low payback have led to SHS providers struggling financially in the country. In this scenario, pay-as-you-go models that tie repayment to usage can help assure customer payback.

Partnerships

To reach scale, companies need substantial working capital, particularly if they produce the systems themselves and provide in-house financing. For this reason, businesses need support from international donors or development agencies or investment from impact investors. The following actors offer support:

- **Development agencies and foundations:** Grants or soft loans from donors support M-Kopa, Mobisol, Off-Grid Electrics, and ONergy. This support is usually used to finance the initial installations; customer fees cover long-term service delivery.

- **Development banks and challenge funds:** Grants and loans from the World Bank support Grameen Shakti, Kamworks, Off-grid Electric, and Sunlabob. Mobisol received preferential loans from German Development Cooperation (GIZ) and the Africa Enterprise Challenge Fund.
- **Governments:** Governments play an important role in financing and raising awareness. The Infrastructure Development Company Limited, a government-owned nonbanking financial institution, provides financing for the Bangladeshi Solar Home System Programme, which installed more than 3 million SHSs in rural Bangladesh. In Tanzania the government established the One Million Solar Homes Initiative and commissioned Off-Grid Electric for the roll-out.
- **Private investors:** Commercial or impact investors can support businesses through equity and debt financing. Two impact investors—ARTHA and Halloran Philanthropies—funded ONergy in India.

Local NGOs increase outreach to communities and raise awareness. Sales agents and microentrepreneurs distribute products and provide after-sales services.

Implementation: Delivering Value to the Poor

Awareness

Businesses use a range of strategies to create awareness about solar electricity:

- **Local agents:** Grameen Shakti, ONergy, and Sunlabob create awareness of their products through local sales agents. Grameen Shakti trained more than 1,200 agents to go door to door to demonstrate the effectiveness of SHSs. It also uses community members, such as teachers, to market products.
- **Word of mouth:** In Uganda word of mouth is the most important sales driver for SolarNow.
- **Demonstration plants:** Placing demonstration SHSs in highly visible places, such as schools or community centers, helps spread the word. ONergy in India established Renewable Energy Centers, where people are trained to become microentrepreneurs and mentors to other SHS users. These centers are also sales points and locations for public demonstrations of SHS products.

Acceptance

Most businesses offer a large product range. Grameen Shakti offers 14 SHS products, ranging in price from USD 100 (for a 10W system) to USD 580 (for a 135W system). Kamworks incorporates suggestions from its customers in designing its products. Many businesses also offer ancillary and complementary goods. Fosera and Mobisol offer energy-efficient domestic appliances that run on direct current.

Reliable service is important for gaining customer trust. Companies such as SELCO guarantee service provision at the customer's doorstep within 24 hours and offer consumer-friendly practices such as buy-back systems and removal of dead batteries. Most businesses offer product warranties for up to three years on the SHS and two years on batteries.

A vast rural distribution network of sales agents and a community-based franchisee model helps establish trust. It develops because potential customers associate the brand with someone from their community. Having a local person responsible for maintaining the systems over time also increases acceptance.

Accessibility

Businesses in areas with high population density make their products available through local agents. Businesses in areas with lower population density must develop additional mechanisms. Many companies work through networks of rural distribution agents who maintain existing systems and sell new products. M-KOPA, for example, has built a network of about 1,000 direct sales managers across East Africa.

Training by local technical or government institutions enables low-skilled people to install SHSs. In 2014 Mobisol established the Mobisol Academy to train local entrepreneurs as technicians and sales agents. Barefoot Power and Onergy train local people in India to become entrepreneurs and build their own businesses or become micro-franchisees and distribute and install SHSs.

When customers cannot be reached within a short time or have a problem, support from a distance is a feasible alternative. M-KOPA installed a free service hotline that users can call seven days a week.

Affordability

A variety of payment models increase the affordability of an SHS (table 22). Under the pay-as-you-go model, customers make micro payments over a period of time at the end of which they own the solar home system. Under the rent-to-own model, a share of every watt purchased goes into the customer's account, allowing customers to acquire the system over time. The fee-for-service model offers electricity at a lower price without the option of ownership. On a pay-per-use plan, customers acquire solar systems for a deposit and then purchase daily usage "credits" for less than the price of traditional kerosene lighting. After one year of payments, customers own their solar systems and can upgrade to more power.

Rather than provide financing themselves, other companies work closely with banks, NGOs, and microfinance institutions to facilitate financing. Interest rates tend to be high. SELCO has forged relationships with 19 banks to create a separate line of credit for financing solar equipment.

Many companies accept payments by mobile phone, allowing customers without bank accounts to purchase a system and relatives from other locations to help finance it. Other companies sell vouchers for different quantities of electricity at shops in rural areas.

Table 22. Prices and financing of solar home systems by selected companies

<i>Company/country</i>	<i>Price of solar home system</i>	<i>Financing model</i>
BGET (Thailand)	<ul style="list-style-type: none"> • 20W = USD 260 	In-house. Customers sign two-year contract, paying about USD 130 a year. Payment is generally made once or twice a year, often after harvest time.
Grameen Shakti (Bangladesh)	<ul style="list-style-type: none"> • 20W = USD 135 • 40W = USD 213 • 80W = USD 351 • 135W = USD 489 	In-house. Installment plan allows customers to make a 10–25 percent down payment and pay the balance over one to three years at a 5–8 percent annual interest rate. Customers who pay cash receive a four percent discount.
Mobisol (Tanzania, Rwanda)	<ul style="list-style-type: none"> • 30W = USD 351 • 80W = USD 801 • 120W = USD 1,245 • 200W = USD 1,742 	Rent-to-own. Payments on company's 36-month pay-as-you-go installment plan are made using mobile banking services.
Off-Grid Electric (Tanzania)	n.a.	Fee-for-service. For a USD 6–10 installation fee, company provides customers with panels, lithium batteries, lights, and a meter. Monthly payments start at USD 0.20 a day for a 20W SHS.
SELCO (India)	<ul style="list-style-type: none"> • 50W = USD 250 	External. Customers typically put 10–25 percent down, paying the balance over three to five years, at interest rates of 5–14 percent annually with participating banks.

The breakeven point for SHS users depends on kerosene and candle prices, which vary across countries. Household electricity expenses range from about USD 4–USD 6 a month in India to about USD 9–USD 10 a month in Kenya and Thailand. In Bangladesh a kerosene lamp producing 37 lumens of electricity four hours a day consumes about three liters of kerosene a month. A 30W SHS that substitutes for the use of three kerosene lamps has the potential to save nine liters of kerosene a month, a savings of about USD 8. If the SHS costs USD 250, the purchaser would break even after about 32 months (European Microfinance Platform 2014).

Results and Cost-Effectiveness

Scale and Reach

The biggest player in the market, Grameen Shakti, has reached about 8 million people in Bangladesh, installing more than 1.5 million SHSs. Most other businesses have reached 100,000–1 million people and are in the process of scaling up, including by expanding to other countries and continents. Sunlabob, for example, started operations in 2001 in the Lao People's Democratic Republic. Since then it has become a global player, operating in Afghanistan, Cambodia, Tanzania, and Uganda.

Several new businesses, including Fosera, M-Kopa, Mobisol, and Off-Grid Electric, have entered the African market in recent year. They offer smart financing models (some of them using mobile technology) and use their distribution channels to sell complementary goods, such as DC televisions, fans, and refrigerators.

Improving Outcomes

Adoption of SHSs improves many outcomes. It increase evening study hours, which can improve educational outcomes and long-term income-earning potential (Khandker, Barnes, and Samad 2012). It reduces fuel collection time for women; increases the use of televisions, which, by providing information, empowers people; improves health, by limiting the spread of respiratory diseases from kerosene consumption (Samad and others 2013); increases security; gives people more time in the evenings for socializing and entertainment (Banerjee and others 2014); and increases savings.

SHSs can also have a major impact on the incomes of people who sell, install, and service the systems. One-third of Mobisol customers have become at least part-time entrepreneurs. Mobisol estimates that they collectively earn more than USD 8 million a year (interview with Klara Lindner, Service Design Lead, Mobisol, May 21, 2015). In Bangladesh most local entrepreneurs and managers selling SHSs are women (interview with Sebastian Groh, CEO, SOLshare, May 18, 2015).

SHSs reduce greenhouse gas emissions and pressure on natural resources used to produce electricity. They cut waste from dry batteries and leaks from kerosene or diesel. The potential negative effects of lead used for the batteries of SHSs on the soil and the rest of the environment have not yet been sufficiently analyzed.

Scaling Up

Challenges

Large investments are needed to reach scale. SHSs require multiple components in separate packages and tools for installation. Batteries are heavy, and cushioned packaging must be used to prevent damage to solar cells in transit (Samad and others 2013). SHSs require a strong after-sales service network, which is challenging to create in rural areas with low population density. (For this reason, many businesses have not yet entered the most remote areas, according to Sebastian Groh, CEO, SOLshare, interviewed May 18, 2015). The other concern is that in the longer term, once people start expanding business activities and needing more electricity, SHS cannot generate enough power.

In some cases, negative incentives can distort the market. Highly subsidized electrical tariffs in on-grid areas in Lao PDR, for example, distort the market and make off-grid customers less willing to pay sustainable rates for power. Off-grid solutions are frequently politicized and considered inferior to on-grid solutions (interview with Albert Kwaw Eliason, Country Officer, Lighting Africa, April 25, 2012).

Because SHSs can provide only a certain amount of DC electricity, domestic appliances must be energy efficient and adapted to DC. This demand has created opportunities for businesses to offer complementary goods as a package solution to SHS users, with potential to boost business viability. However, for many countries, these appliances and the SHS will need to be imported, requiring access to large amount of foreign currency and making the market vulnerable to foreign exchange fluctuations.

Bangladesh, which pioneered SHSs, shows that governments can support the creation of local supply chains. Grameen Shakti based its expansion strategy on existing SHS infrastructure (local manufacturers and technology) and local human capacity for maintenance services (interview with Sebastian Groh, CEO, SOLshare, May 18, 2015).

Role of Government and Public Policy

Governments can foster the development of SHSs in several ways. They can create a conducive ecosystem for social enterprises to reach scale, as the government did in Bangladesh through the state-owned Infrastructure Development Company Limited (IDCOL). IDCOL works with over 50 participating nongovernment organizations, known as partner organizations, that sell, install, and maintain the SHSs. IDCOL provides direct subsidies that encourage reductions in SHS prices to customers, as well as support for microcredit financing, which makes the price of SHSs affordable (ADB 2015). In terms of tax incentives, Bangladesh, India, Kenya, and Tanzania impose no duties on imported SHSs and exempt renewable energy from value added tax. Tanzania subsidizes the purchase of solar photovoltaic. Other countries have used targeted credit lines for solar power, or established funds directed to offsetting the high upfront capital costs for wide scale deployment of SHS.

In 2015, the Tanzanian national government announced its One Million Solar Homes initiative, aimed at providing 1 million homes with access to reliable solar electricity by the end of 2017. Off-grid Electric Ltd. will be implementing this initiative, which will help the company reach scale. The International Finance Corporation's Lighting Asia and Lighting Africa initiatives, which multiple governments support, are likely to support the scaling up of SHS businesses in Asia and Africa.

Governments can also support businesses by providing market contacts and information on their own electrification plans. The government of Rwanda, for example, shared its grid extension strategy with Mobisol to guarantee the most effective electrification coverage. It shared grid maps with the company and facilitated entry by providing contacts at the village level (interview with Klara Lindner, Service Design Lead, Mobisol, May 21, 2015).

Table 23. Social enterprises: Solar home systems in low-income areas

<i>Company</i>	<i>Countries</i>	<i>Description</i>
Barefoot Power Limited	Kenya, Rwanda, Uganda	Develops and sells affordable high-quality 1.5W-30W solar products to off-grid households around the world. www.barefootpower.com
Border Green Energy Team (BGET)	Thailand	Rents equipment customers need to use company's installed solar panels. Offers other solutions commensurate with villagers' financial means, ranging from personal-use lanterns and mobile chargers to state-of-the-art home systems. www.bget.org
Fosera	Ethiopia, India, Kenya, Mozambique, Portugal, Thailand	Sells high-quality systems for light generation, phone charging, and powering of radios and televisions. Special features are Li-Battery technology, ultra-efficient LEDs, and modular system design, which allows systems to grow with demand by user. www.fosera.com
Grameen Shakti	Bangladesh	Offers market-based program with social objective; includes other renewable energy technologies for millions of rural villagers. Their work not only focuses on the technical and capacity-building sides of renewable energy promotion. They have also adopted the Grameen Bank's experience in micro financing to make renewable energy applications affordable for poor rural people. www.gshakti.org
Kamworks	Cambodia	Designs and manufactures products such as a plug-and-play SHSs and the award-winning MoonLight Solar Lantern. www.kamworks.com
Kingo Energy	Cambodia, Guatemala	Sells prepaid electricity, allowing customers to consume energy on a pay-per-use basis. Customers do not pay for installation or maintenance. www.kingoenergy.com
M-KOPA	Tanzania, Uganda	Makes solar products affordable to low-income households on a pay-per-use plan. Customers acquire solar systems for a deposit and then purchase daily usage "credits" for less than the price of traditional kerosene lighting. After one year of payments, customers own their solar systems and can upgrade to more power. www.solar.m-kopa.com
Mobisol	Rwanda, Tanzania	Combines solar energy with microfinancing to reduce barriers rural poor face to adopting renewable energy technologies. www.plugintheworld.com/mobisol/
Off-Grid Electric	Tanzania	Sells prepaid electricity, which customers buy weekly via mobile money. www.offgrid-electric.com
Onergy	India	Provides lighting, cooking, and electrification solutions in rural areas. www.onergy.in
SELCO India	India	Provides customized solar home lighting systems, partnering with banks to provide financing. www.selco-india.com
SIMPA	India	Sells prepaid power based on usage, with part of each payment going toward the purchase price of the SHS. www.simpanetworks.com
SolarNow	Uganda	Sells SHS at affordable financing terms. www.solarnow.eu

Table 24. Social enterprises: Solar homes systems in low-income areas (continued)

<i>Company</i>	<i>Countries</i>	<i>Description</i>
Soluz Honduras	Honduras	Provides, distributes, and finances solar energy products in areas with no access to electricity grid. www.soluzhonduras.com
Sunlabob Renewable Energies Ltd.	Afghanistan, Cambodia, Lao PDR, Tanzania, Uganda	Offers range of energy products and services; pioneered franchised approach to rural electrification. www.sunlabob.com
Zara Solar	Tanzania	Sells and installs SHSs in rural households and institutions. Imports products from reliable suppliers from all over the world. www.zarasolar.com

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Challenge

Just 9 percent of the rural population of Sub-Saharan Africa has access to electricity (Public Private Partnership in Infrastructure Resource Center n.d). The rest use kerosene lamps and other fossil fuel sources, which are inefficient, unhealthy, harmful to the environment, and very costly.

Innovation

Mobisol (www.plugintheworld.com/mobisol/) offers high-quality solar home systems (SHS) and direct current (DC) appliances to rural customers in Rwanda and Tanzania, financed through an innovative payment scheme. The pay-as-you-go installment method circumvents initial investment hurdles for customers who could previously not afford a high-quality SHS.

Mobisol systems are available in four sizes: 30, 80, 120 and 200 watts. The smallest version can light two rooms and charge four mobile phones a day. The largest version powers multiple lights as well as consumer appliances, such as laptops, TVs, and refrigerators; it can also charge up to 10 mobile phones simultaneously. Mobisol also designs business kits for entrepreneurs. Such systems can power multiple phone chargers or a barber's hair clipper.

The company offers a 20-year warranty on the solar panel and a 3-year warranty on the battery and lighting equipment. While the product is under warranty, the company provides free maintenance and repair. Using a global system for mobile communications modem allows the company to both address maintenance problems swiftly and lock the system if payments are not made.

To buy the smallest system, customers make a USD 27 down payment and agree to pay USD 9 a month for 36 months. They then transport the SHS to their homes themselves; a Mobisol technician comes to the customer's home the next day to install the system. Payments are made via mobile phones. After customers complete the 36-month installment plan, Mobisol electronically unlocks the SHS, which can then be used free of charge.



In 2014 the company established the Mobisol Academy to train local entrepreneurs to service customers and represent Mobisol as a leader in the sustainable energy industry in East Africa. After three weeks of theoretical and practical training, the entrepreneurs start providing customer services.

Impact

Since its establishment, in 2010, Mobisol has installed over 70,000 SHSs reaching more than 300,000 people in Rwanda and Tanzania and reducing CO₂ emissions by approximately 30,000 tons a year. The systems have increased the number of hours of light in the evenings, allowing children to study and families to spend more time together. One-third of Mobisol customers become at least part-time entrepreneurs, using the additional electricity they generate to offer services to their communities.

Scaling Up

Connecting the rural areas in which Mobisol operates to the grid is not financially viable; even government electrification strategies have started looking at decentralized energy solutions like SHS. There is thus high demand for off-grid electricity supply and Mobisol has been experiencing triple digit growth to respond to the demand. The company operates in Rwanda, Tanzania and more recently Kenya, with plans to go into Ethiopia and other countries. In Rwanda the company is coordinating its expansion strategy closely with the

government, which invited Mobisol to complement its national electrification strategy and provides Mobisol with contacts at the village level.

Scaling up the program depends critically on the presence of mobile networks and mobile money services. Both are already widespread in East Africa, and penetration is increasing.

Two main factors constrain expansion. The first is finance, as systems are paid for over-time rather than upfront and this requires financing. The second is the lack of DC appliances. Mobisol's systems work only with DC appliances, which are more energy efficient and require less maintenance than alternating current (AC) appliances. In the countries where Mobisol is operating, no sales infrastructure for DC appliances exists; Mobisol therefore has to supply users with these products, which often need to be imported and can face foreign exchange restrictions.

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Challenge

One out of four people in India lacks access to electricity, according to the World Bank's Sustainable Energy for All database. Most of them live in rural areas that are too remote to have a grid connection.

Low-income households without access to electricity rely on wood or other biomass for cooking and heating—sources of fuel that are expensive and create both indoor and outdoor air pollution. Adopting clean energy solutions is often difficult, however, because remote areas often lack the after-sales services and infrastructure that make such solutions feasible.

Innovation

ONergy (www.onergy.in) offers solar products to rural people in India. Its best-selling products are solar home systems (SHS) of 20–75 watts, which sell for USD 130–300. Customers pay 20–30 percent of the price as the down payment, financing the remainder with a five-year loan.

In 2014, ONergy introduced several new products, including a 10-watt plug-and-play solar home lighting system (USD 50–90), solar irrigation pumps (USD 2,000–10,000) and solar micro-grids (USD 1,000–50,000). Other innovative products include solar energy-powered TVs, computers, micro-grids, and irrigation systems that are not offered by any competitor in the states in which the company operates. The company has also developed a specific charge controller, which includes a mobile phone charger and shows the level of battery charge remaining.

ONergy develops high-quality products, supports them with a strong after-sales service network, facilitates consumer financing, and develops an ecosystem for sustainable development and rural empowerment. It has created a full-service infrastructure by establishing distribution centers (known as “renewable energy centers”) operated by a network of trained rural entrepreneurs and leveraging existing networks of local NGOs,



self-help groups, and microfinance institutions to market its products, raise awareness, and provide financing.

Impact

Since its foundation, in 2009, ONergy has established 18 renewable energy centers, reaching over 2,000 villages. It has set up more than 150 micro-grid systems and installed 40 solar-driven irrigation pumps. Its solar solutions are estimated to have improved the lives of over a quarter million people.

Scaling Up

ONergy is operating in some of the poorest states in India, where energy infrastructure and electricity supply are lacking. Few other energy companies are active in these regions, resulting in massive market potential for ONergy. The poor state of infrastructure in these states is also a challenge, however. Many people in rural India either do not know about solar solutions (and thus need to be convinced of the added value) or have had a bad experience with solar products and are not interested in trying solar energy again. ONergy works to overcome these barriers by educating consumers about the value of its products.

Electrifying Rural and Remote Areas through Mini-Grids

Isolated grids connect millions of people at the bottom of the pyramid to power for the first time

HIGHLIGHTS

- Mini-grids provide decentralized, efficient electricity, connecting remote communities that lack access to the main grid.
- Mini-grids bridge the gap between small solar home systems and large grids, offering customers nearly the same service as a grid connection.
- Many systems can expand as demand for energy increases.
- Customer-friendly payment schemes, including mobile payment, prepaid scratch cards, and smart metering, make systems easy to use and provide back-end information about grid use.



Summary

Power supply is critical to development, but utilities in many low- and middle-income countries either lack the financial capacity to expand their grids to isolated rural areas or choose not to do so because of the low return on investment. Connecting households to mini-grids is a cost-effective solution in many areas.

Development Challenge

Some 1.2 billion people lacked access to electricity in 2013 (IEA n.d.). Most of them live in rural areas in Sub-Saharan Africa and South Asia. They rely on traditional biomass, kerosene, and batteries, which are expensive and pose environmental, safety, and health

risks. Lack of regular access to power also hinders rural development, slows the formation of human capital, and reduces the quality of life for people at the bottom of the pyramid.

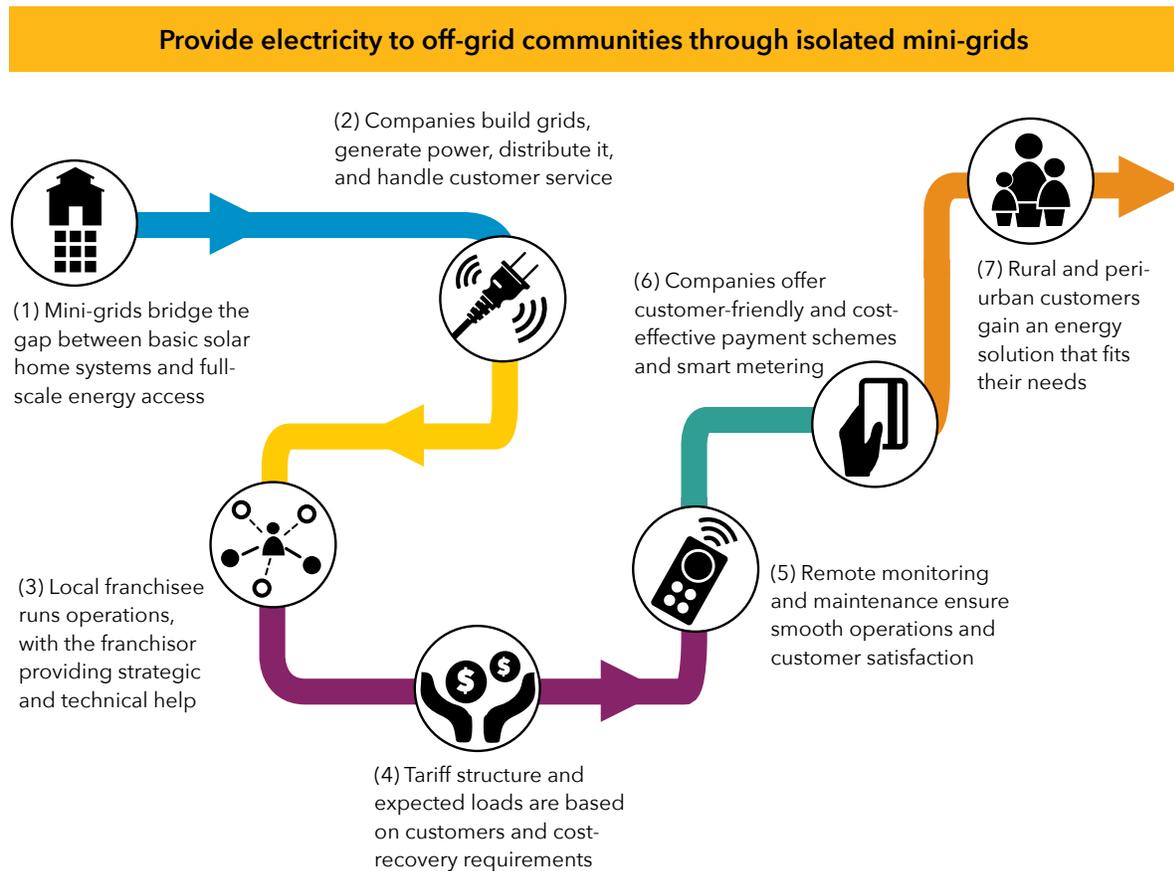
Power supply is critical to economic and human development, but utilities in many low- and middle-income countries either lack the financial capacity to expand their grids to isolated rural areas or choose not to do so because of the low return on investment. Off-grid solutions are therefore needed.

Business Model

Components of the Model

A mini-grid is a set of electricity generators and storage devices connected to a distribution network that provides electricity to communities and customers that are not connected to the main grid. Most of them use low alternating current (AC) voltage (220V–380V) or direct current (DC) with a centralized production and storage system and have installed capacity of 5kW–500kW (World Bank 2008). Companies operating mini-grids usually build the grids,

Figure 14. Components of the mini-grid model



generate and distribute the power, and take care of all customer-related services, including marketing and bill payment (figure 14).

Mini-grids use a range of technologies. Diesel-powered mini-grids are expensive and unreliable. For this reason, many mini-grids combine diesel with hydro or other renewable energy resources, which reduces storage costs. Many mini-grids could be reconfigured with renewable sources of energy.

Mini-grids bridge the gap between basic and full-scale energy access, enabling people to use electricity to light homes and power devices such as cookstoves, refrigerators, and mobile phones. An estimated 29 million rural or peri-urban households worldwide could be served on a commercial basis by isolated mini-grids (Tenenbaum and others 2014).

Cost Factors

The size of the required investment and payback period vary, depending on size, technology used, and other factors such as distribution line. Village grids that can be connected to the national grid at a later stage cost more than low-voltage DC micro-grids that cannot be connected to the national grid.

In Tanzania, Devergy covers the installation cost of the micro-grid, except for a small fee charged to users at the time of first connection. The initial investment of USD 6–12 per household covers metering, wiring, two LED bulbs, and installation. The balance is built into the per-use energy charges users pay. This arrangement makes Devergy's proposition more affordable than solar home systems, which require larger upfront capital outlays. The payback period of a Devergy system is about two and a half years.

Table 25. Monthly end-user costs for electricity provided by selected mini-grid providers

<i>Company/country</i>	<i>Volume of energy provided</i>	<i>Monthly cost</i>
DESI Power (India)	11W	USD 1.50
Devergy (Tanzania)	Enough power to charge 2 LED lights and a mobile phone	About USD 5.00
Husk Power Systems (India)	<ul style="list-style-type: none"> 50W = USD 250 Enough power to charge 2 x 15W CFL lights and a mobile phone	USD 2.20

Revenue Streams

Mini-grids generate revenues by selling electricity to consumers and other customers. In India DESI power sells electricity to anchor clients, such as telecom towers and rice mills. Revenues from these customers cross-subsidizes service for household use.

Financial Viability

Costs and tariff structures of mini-grids vary, depending on the size and energy source of the mini-grid, the socioeconomic status of users, the type of operator (private or public), the ownership model, and the funding structure (for-profit, partly or fully subsidized). Mini-grids may be owned and managed by the state, private sector or communities. Often a combination of different actors is involved, owning or managing different parts of the system, such as the production, distribution and demand management systems. (GVEP 2011)

Many mini-grids are set up as part of the national electrification initiative and are at least partly financed by governments. Other companies are strictly private. One, Husk Power Systems, is profitable at the plant level, with a gross margin of 20 percent.

It typically takes two to three months for a plant to reach operational profitability and two and a half to three years to recoup capital expenditures (with subsidies). Husk Power Systems has secured formal equity investment, but grants and some equity from the owners still finance capital and operating costs. The company is struggling to secure capital needed to develop its franchise approach, because banks are not willing to take the risk on an early-stage venture.

Partnerships

Enterprises operate based on four main models:

- The *utility-based model* is the most common approach to rural electrification in developing countries. The utilities may be national public institutions, private units, or cooperatives. They focus mainly on areas consigned by governments. Powerhive East Africa Ltd., an impact-driven, for-profit mini-grid developer, is the first private company in Kenya to receive a utility concession to generate, distribute, and sell electricity to the Kenyan public (Powerhive 2015).
- *Private sector models* are either fully for-profit or partially subsidized. Commercial entities develop the mini-grids and either operate, lease, or sell them to other actors. For-profit village grids charge tariffs that allow them to earn profits, achieved through the ABC model (Anchor client, Business, Consumer). Under this approach, the operator sells electricity through a power purchase agreement to an anchor customer, such as a mobile phone company. Small businesses and individuals with lower energy consumption are serviced at an affordable price thanks to the economies of scale achieved through the anchor client.
- *Community-driven models* tend to be partially or fully subsidized. Government organizations such as the Orissa Renewable Energy Development Agency (OREDA) in India fund the implementation and operation of small village mini-grids. The community—often represented by a village electrification committee—manages operations, tariff collection, and maintenance. Community models can offer subsidized tariffs for basic energy services for a few hours a day to low-income customers.
- *Hybrid business models* combine aspects of various approaches in order to maximize effectiveness and efficiency.

Implementation: Delivering Value to the Poor

Awareness

All stakeholders—customers at the bottom of the pyramid, local businesses, government (from local governing structures to national governments), and the banking sector—need access to information about all available energy solutions to find out which solution is affordable and best fits their needs. Tanzania’s Scaling-Up Renewable Energy Programing Low Income Countries (SREP) program mapped out which households could be connected to the grids, how many would best be connected through mini-grids, and how many could be connected by stand-alone solutions such as solar home systems. It created awareness about the different solutions and provided the political framework supporting the development of mini-grids (Climate Investment Fund and SREP 2013). To create awareness at the customer level, Mera Gao Power staff visits villages for and collaborates with NGOs.

Acceptance

Strategic planning, not just a site analysis and the identification of technical solutions, is a key aspect of running a successful mini-grid business (Inversin 2000). In-depth studies of the national electrification agenda, the economic circumstances of potential customers, and projections of future development in the community (for example, the potential productive use of energy and plans for extending the central grid) are essential.

Successful developers integrate local partners in the development of new sites; local knowledge is as vital as technical knowledge. The German enterprise Inensus funded the joint venture ENERSA S.A. with the Senegalese company Matforce CSI to set up mini-grids in Senegal in order to be able to tap local knowledge.

Monitoring and maintenance are critical to ensure the smooth operation of the grid. Remote monitoring in combination with a local service team helps improve the efficiency of operations and thus increase customer satisfaction and profitability.

Availability

Mini-grid operations are locally based; much of the day-to-day business cannot be performed at a headquarters located elsewhere. Many companies (including Husk Power Systems, India) therefore use a franchise model to facilitate scaling, transferring responsibility for local operations and investments to the franchisee (the franchisor provides general strategic, technical, and practical expertise).

Affordability

Tariff structures and expected loads are developed to match the customer base and cost-recovery requirements. India's D.E.S.I Power projects future customer use of power to size the grid correctly in order to strike the right balance between affordability and future growth of the grid. Tariff collection that meets the reality of customers' situations is critical. Powerhive, in Kenya, offers customers the opportunity to prepurchase electricity through mobile banking services.

Results and Cost-Effectiveness

Scale and Reach

The number of customers ranges from a few to a few hundred per mini-grid. Devergy started operations in Tanzania in 2012; it now serves almost 1,000 customers. Husk Power Systems, founded in 2007 in Bihar, India, serves 210,000 people in 250 villages, through 91 plants powered by rice husk.

OREDA serves customers in India who earn USD 16–24 a month. They can afford its services only because they are subsidized. In Tanzania Devergy has connected about 1,000 households in six villages. It is connecting more than 100 new households every month.

Desi Power provide services to 14 villages in India, reaching 2,000 people. Its biomass gasifiers provide electricity that is more reliable and about 25 percent less expensive than diesel-based generation. In all villages where DESI Power has installed a plant or set up a solar pump for irrigation, it has replaced the diesel generator sets, reducing carbon dioxide emissions.

Improving Outcomes

Mini-grids have a variety of positive effects. They extend villagers' activities beyond daylight hours, enhancing the quality of life and promoting economic development, by allowing local shops, eateries, and small-scale manufacturing units to stay open longer. They increase the time children can study, improving educational outcomes. They reduce indoor air pollution and the risk of fires from kerosene, improving health and reducing accidents. They save consumers money. They prevent damage to the environment from the improper disposal of zinc-carbon batteries (widely used for operating radios). They also create jobs. DESI Power, for example, has created at least 25 direct and 200 indirect jobs per village.

Cost-Effectiveness

Mini-grids can be a viable and cost-effective route to electrification. Rural residents in Tanzania who use a mini-grid, for example, spend about 20 percent less on lighting and about 50 percent less on phone charging than rural residents without access to the mini-grid.

Many demonstration projects have proved the technical feasibility of this solution. The business case for mini-grids has yet to be made fully, however, because of the complexity of regulatory frameworks, financing challenges, and other factors.

Scaling Up

Challenges

The pace at which mini-grids are being constructed remains limited, because of a variety of challenges. Most can be transformed into drivers.

Role of Government and Public Policy

Governments can promote the expansion of mini-grids in many ways. They can develop a long-term vision for the sector (IFC 2012) and share information on their plans to extend the main grid. They can streamline licensing and approvals, set appropriate tariffs, help increase access to financing, create a market ecosystem, training on mini-grids operations, and facilitate information flows.

Streamlining licensing and approval: The public sector can reduce costs and encourage entry by simplifying licensing and approval schemes. Sri Lanka's renewable energy policy is a good example of how regulation can promote electrification. The country set up an enabling regulation for renewable energy systems below 10MW (to feed into the grid) in 1996. Regulations were revised several times; by the end of 2011, 243MW of capacity had been installed, all of it operated by private companies (Tenenbaum and others 2014).

The government of Tanzania facilitates the set-up of mini-grids for up to 1MW by allowing these small systems to forgo complex licensing process; systems below 100kW do not even need approval of end-consumer tariffs (Tenebaum and others 2014). This enabling political environment induced Devergy to start operations in Tanzania. In contrast, onerous licensing rules and high tariffs in Ghana forced Devergy's license partner there had to stop its operations after installing 300 connections.

Setting appropriate tariffs: Electricity generation costs are higher for mini-grids than for grid connections. Policy makers have to decide whether to structure tariffs to reflect costs or set uniform national tariffs, which would imply cross-subsidization of mini-grid customers. Tariffs that reflect costs may be the fastest way to provide electricity.

Increasing access to financing: Mini-grids require upfront investment of up to a few million dollars. The public sector and donors can increase access to financing by enterprises, leveraging public-private partnerships, providing smart subsidies for grid extension, and guaranteeing loans from commercial banks (IFC 2012). Debt financing mechanisms and guar-

antees, such as the German government's export credit insurance, can support the scaling of mini-grids.

Results-based financing involves the cash payment or nonmonetary transfers by a national or subnational government after predefined results have been attained and verified. Devergy has developed a program in which contractors are paid in full only when the quality of the installation has been proven in operations. Combining results-based payment with results-based finance could leverage the scaling progress.

Create a market ecosystem: Mini-grid companies need to establish linkages with local and national businesses, communities, sectors with demand for power, international developers, technology providers, and financiers. Fostering such a market ecosystem offers a high-impact opportunity for the public sector and donors. Support can be provided by enabling the development of a more standardized technology.

Provide training: Public technical institutes or vocational schools could offer training to equip staff with the technical qualifications for installation and maintenance of mini-grids as, for example, the Ethiopian Adama Institute for Sustainable Energy at the Adama Science and Technology University does.

Facilitate access to information: Public sector actors and donors can help ensure access to relevant information for all stakeholders (public sector, communities, developers, investors, third sector organizations). This includes public disclosure of government plans and time frames for central grid extensions, as this informs enterprises of areas of market potential. Facilitating information access includes raising awareness among end-consumers that energy is a purchased (not free) product in order to discourage theft.

Table 26. Social enterprises: Providers of mini-grid access

<i>Company</i>	<i>Countries</i>	<i>Description</i>
Aga Khan Rural Support Programme	Pakistan	Pioneer in community-based development approaches builds locally managed mini-hydro plants throughout Chitral district. Community-owned and -operated plants generate clean, affordable, and reliable electricity 24 hours a day.
Community, Energy and Technology in the Middle East	Israel, West Bank and Gaza	Israeli-Palestinian organization provides green energy and clean water services to off-grid communities using environmentally and socially sustainable methods, empowering some of the poorest and most marginalized communities in the West Bank and Gaza through the construction of wind and solar energy systems, clean potable water solutions, capacity building, and reliable maintenance.
Desi Power	India	Biomass gasification plants (30kW-150kW) help set up microenterprises /cooperatives by ensuring biomass supply and plant load; targets Industrial customers with high peak loads requiring reliable power.
Devergy	Tanzania	Provides low-power solar micro-grids that are typically shared by groups of up to five households. Modular nature of panels allows installed capacity to be easily expanded when demand increases.
Electricité de Haiti (EDH)	Haiti	Diesel-run, municipal-owned mini-grids. Formalized process to develop these micro-grids evolved over years, and currently involves several levels of public agencies and private sector (for profit and NGOs) players working together to build, operate and maintain a micro-grid to electrify rural communities.
Foundation Rural Energy Services	Burkina Faso, Guinea-Bissau, Mali, South Africa, Uganda	Small multinational uses market-based approach to establish small-scale commercial electricity companies in areas that have no grid access.
Green Empowerment/Tonibung/PACOS	Malaysia	Green Empowerment and Tonibung are nonprofits working together to finance and develop micro-hydro-micro-grids while integrating community empowerment goals into rural electrification. The NGO PACOS is the community empowerment partner.
Husk Power Systems	India	Builds small-scale systems in remote rural villages that generate and distribute power cheaply enough for base of the pyramid consumers to afford. Each system consists of a 30kW-50 kW power plant that runs entirely on rice husks. Micro-grid connects subscribers directly to the plant using insulated wires strung from bamboo poles.
IBEKA	Indonesia	Works with communities to develop their local skills and builds their ownership to manage and maintain off-grid hydro schemes. Lobbied to change law so that national supplier must buy electricity from small grid-connected hydro-schemes, a change that has enabled new schemes to be built under community management and existing off-grid schemes to be connected later if grid expands.

Table 25. Social enterprises: Providers of mini-grid access (continued)

<i>Company</i>	<i>Countries</i>	<i>Description</i>
Inensus GmbH (Sengalese JV: INENSUS West Africa S.A.R.L.)	Senegal, Somalia, Tanzania	Integrates small wind turbines with solar and diesel power sources. The hybrid design optimizes power set-ups, with wind and solar resources complementing each other, reducing diesel fuel consumption and battery cycling.
Mera Gao Power (MGP)	India	Provides service-specific micro-grids to meet lighting and mobile charging requirements of rural people.
Powerhive	Kenya	Off-grid metering and control solutions offer customers opportunity to prepurchase electricity for commercial and residential use through mobile banking services. Acts as intermediary between generators and users.
Remote Village Electrification Program (CREDA)	India	Government agency installs and operates mainly solar photovoltaic micro-grids through contractors.
Saran Renewable Energy	India	Provides reliable electricity to small businesses from biomass gasifier and reliable income to farmers who produce the biomass.
WBREDA	India	Electrifies isolated communities, including villages in the Sundarbans, a mangrove-filled delta in the Bay of Bengal and a Bengal tiger reserve.

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	<p>PROFILE</p> <p>Devergy</p> <p><i>Using pay-as-you-go solar micro-grids in Tanzania to provide rural consumers with affordable energy</i></p>
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Challenge

Tanzania has one of the lowest electrification rates in the world. Just 14 percent of its people—a mere 3 percent in rural areas—has access to electricity (World Bank n.d.)

The main sources of energy in rural areas include traditional biomass, kerosene, and batteries, which are not only expensive but also pose environmental, safety, and health risks. Lack of access to regular supply of power also hinders rural development. Utilities either lack the financial capacity to expand their grids to isolated rural areas or choose not to do so because of the low potential return on investment.

Innovation

Founded in 2010, Devergy (<http://www.devergy.com/>) provides energy services through low-power solar micro-grids that are typically shared by up to five households. The modular nature of the product allows the company to optimize the size of the system to meet the exact demand of users, which, at least initially, typically use it only to charge their mobile devices or provide lighting, avoiding the “oversizing” often associated with traditional mini-grids.

Devergy covers the installation cost of the micro-grid, except for a small fee charged at the time of first connection. The initial investment ranges from USD 6 to USD 12, which covers metering, wiring, two LED bulbs, and installation. The balance is built into the per-use energy charges paid by users. This arrangement makes Devergy’s proposition for the end-user more favorable than solar home systems, which require higher upfront capital outlays. The payback period of a Devergy system is about two and a half years.

Devergy uses differential pricing based on users’ purchasing power. It charges better-off customers a higher price in order to cross-subsidize the tariffs of lower-income customers. Prepaid energy packages start at USD 0.20 a day.



This solar panel mounted on a tripod provides affordable energy to households in a Tanzanian village.

The systems generate energy in direct current (DC), saving 20 percent of the system costs by eliminating the need for a costly inverter. As most electrical appliances available in the markets are made to run on alternating current (AC), Devergy also supplies energy-efficient DC products (lighting products, refrigerators, TVs).

A key feature of the system is the household energy meter. Users can top up the energy account by buying Devergy vouchers from local stores, from Devergy engineers in the village, or through mobile money. Selling energy based on hours of light, phone charging, or other applications makes it easier for customers to choose the services they want and monitor their consumption.

Devergy uses a community-based communication approach, which makes users a part of the decision-making process from the start of a project. Meetings with villagers, elders, and leaders are held to discuss and assess users' needs.

Impact

Devergy has connected about 1,000 households in six villages to its solar grids, providing them with access to cleaner, safer, and less expensive energy. More than new 100 households in Tanzania are being connected every month.

Rural residents in Tanzania typically spend USD 6–25 a month on kerosene, phone charging, and zinc-carbon batteries for radios. After installation of Devergy's micro-grids, they spend as much as 20 percent less than they had been spending on kerosene for lighting and about 50 percent less for phone charging.

One of the key impacts of access to energy is stimulation of economic activities by allowing local stores, restaurants, and small-scale manufacturing units to operate for longer

hours. Micro-grid energy also overcomes the risk of fire and accidents caused by kerosene use, and the lighting it provides allows children to study at night. Lack of a proper disposal system for zinc-carbon batteries (widely used for operating radios) has severe environmental and health risks, including pollution of the soil with toxic materials. Devergy micro-grids help address all of these issues.

Most of the company's employees are local people, who provide the technical support for the installed systems and act as a continuous interface between Devergy and the communities it serves. By providing individuals in the community with solar engineering training, Devergy aims to improve their income prospects.

Scaling Up

Devergy has mainly targeted household customers. Going forward, it plans to develop solutions to cater to the needs of businesses as well. Some of the solutions under development include refrigeration, entertainment applications (such as cinemas), and agricultural equipment (grain mills and rice huskers).

The regulatory framework in Tanzania provides a conducive ecosystem for private sector participation. A project below 100 KW, for example, does not require a government license or approval for tariffs. The government's "Rural Energy for Rural Electrification" program promotes private and NGO participation to set up renewable energy mini- and micro-grids that sell power directly to retail customers. The government has also removed value added tax and duties on solar components, such as panels, batteries, inverters, and regulators, allowing end-users to buy solar at an affordable price.

The regulatory framework in other countries may not be as supportive as in Tanzania, which could constrain the growth and replication of Devergy's model. The partnership in Ghana, for example, did not move beyond the pilot stage because of regulatory issues regarding licensing and tariffs.

A few factors constrain expansion. The working capital requirements of Devergy are high, because it finances its sales. (Other sources of financing for customers, such as micro-finance, tend to go toward income-generating activities, not the purchase of household applications.) Devergy's operations are not yet profitable. It has relied largely on grants and investments by the DOEN Foundation, Persistent Energy Partners, EEP Africa, and others. Additional grants and capital are required to sustain the growth momentum and expand the user base.

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Challenge

Despite its fertile land, the district of Araria in the Indian state of Bihar is one of the poorest in India. To escape its poverty, many young villagers migrate to cities in search of jobs. The challenge is to reduce migration by improving agro-productivity by selling irrigation water to small-scale farmers and creating nonagricultural jobs in the district.

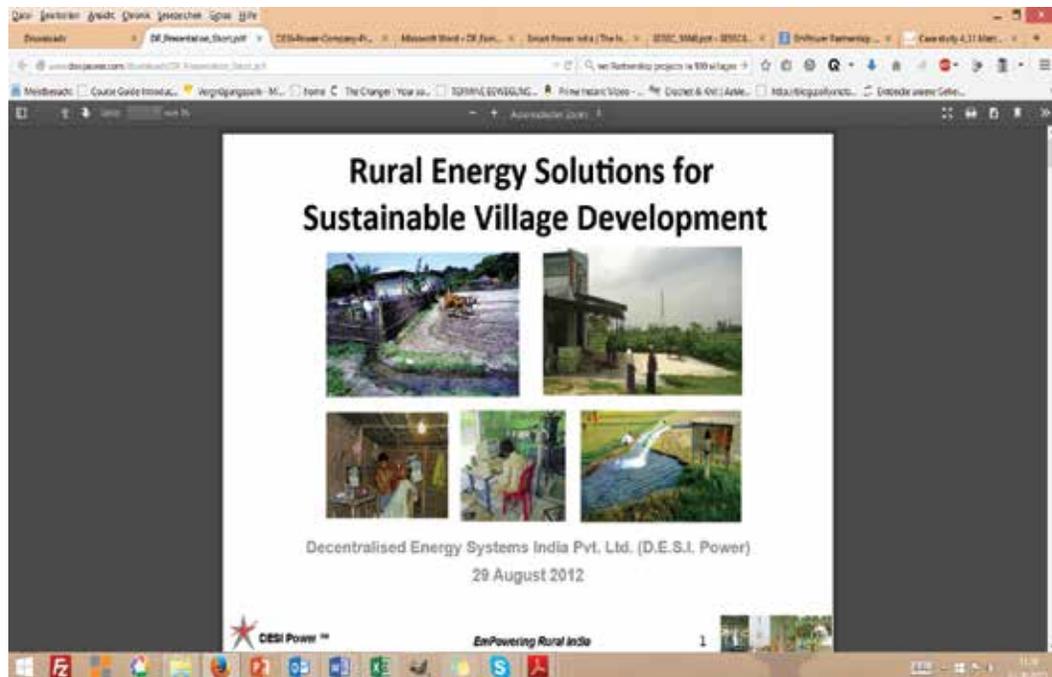
Innovation

Founded in 1996, DESI Power (www.desipower.com) provides reliable and renewable electricity and employment to reduce rural poverty and promote economic development by installing and running biomass mini-grids. The mini-grids provide households with light, farmers with irrigation water and agriculture processing, and small entrepreneurs with increased earning opportunities.

From 1998 to 2008, DESI Power built, tested, and modified power plants and mini-grids until it created a technology that worked in the rural context: stand-alone power plants that run on local biomass and solar power. The company now operates mini-grids in 14 villages. To make the business model financially viable, it sells electricity to anchor clients like telecom towers, rice mills, and other clients that use electricity for productive use. It uses the revenues from these customers to cross-subsidize service for household use.

The radius of the larger power stations is one kilometer. People who live outside that power station's catchment area can be connected through DESI Power's tiny grids, which supply 10–20 households with enough power to light their homes, charge their phones, and supply irrigation water.

DESI Power trains villagers to run and maintain the village grid, often employing women. It seeks to create self-reliant villages with a decentralized electricity-driven development process based on local value addition of agro-residues, renewable energy, and other resources. About two-thirds of new income generated stays in the village.



DESI Power empowers rural communities with electricity and irrigation solutions.

Impact

In the 14 villages in which DESI Power is active, 2,000 people benefit directly from its power. The company's biomass gasifiers provide electricity that is about 25 percent less expensive than diesel-based generation and more reliable. In all villages where DESI Power has installed a plant or set up a solar pump for irrigation, it has replaced the diesel generator sets, reducing CO2 emissions. In addition, the company has created at least 25 direct and 200 indirect jobs per village.

Scaling Up

DESI Power has scaled up only slowly, partly because of lack of finance. One power plant and micro-grid requires USD 55,000–70,000 of investment. Electricity-consuming microenterprises can create local jobs, but it costs about USD 15,000–25,000 per village to set up businesses and upgrade machines. DESI Power is now in the process of raising funds to build power plants, micro-grids, and some anchor loads in 100 villages, an effort that requires substantial funds.

The operations of DESI Power are not yet profitable, because of the large capital outlays, lack of constant load, and fact that no financial arrangements are available to help local entrepreneurs develop their businesses in rural areas. The first pilot power plant in a village was financed by the grant DESI Power won from the World Bank's Development

Marketplace. Other donors, such as the Rockefeller Foundation, are providing soft loans and grants to invest in new power plants, micro-grids, and some key anchor loads.

The government's focus on central grid expansion and its lack of support for decentralized power provision, limit scaling up. Without the government's cooperation, DESI Power cannot create a micro-grid using central grid infrastructure, which would enable it to speed up project development and access to many customers. There is no policy that accepts and promotes mini-grids as a means of reaching full electrification in rural areas. A solution for the coexistence and interaction of the centralized and decentralized systems, would greatly improve access to energy in rural areas.



SECTORAL BUSINESS MODELS

WATER & SANITATION



Bringing Clean, Affordable Water to Poor Communities Through Decentralized Water Treatment Kiosks

Water treatment kiosks for the underserved provide a quicker, sustainable safe drinking water solution to improve health and economic outcomes

HIGHLIGHTS

- Decentralized water treatment kiosks can be constructed in just six weeks, providing immediate access to clean drinking water.
- The kiosks can reach thousands of users not connected to public infrastructure, at a lower cost than alternatives.
- Community members are trained to run and operate kiosks, helping ensure project sustainability and accountability.



Summary

Access to clean water in developing countries is constrained primarily by the limited reach of piped infrastructure, which many countries lack the resources to expand. Decentralized models of water treatment and distribution present an innovative, affordable, and sustainable solution for providing clean drinking water to the poor.

Development Challenge

An estimated 748 million people in the world lack access to an improved drinking water source, and 73 million of them rely on untreated surface water (WHO/UNICEF 2014). The World Health Organization (WHO) estimates that inadequate drinking water, sanitation, and hygiene caused 842,000 diarrheal disease deaths per year in (2014). In addition to neg-

ative impacts on health, lack of access to water stifles economic growth by keeping people out of work and school, with disproportionate effects on women and girls. In some countries with large populations without access to drinking water, such as India, the health and other costs associated with consuming untreated water are estimated at USD 600 million a year (WB, 2015). Discharge of untreated water also pollutes and damages the environment.

Centralized filtration and expansion of existing piped water distribution systems are resource intensive and time consuming, and they require government capacity that is often lacking. In contrast, decentralized water treatment models treat ground and surface water locally, providing safe, healthy, and affordable drinking water to communities previously without access. These solutions usually require construction of a treatment plant and the design of a low-cost sales and distribution systems.

Decentralized water treatment models were initially developed to address the water access gap in rural areas. Many of the new units are being set up in urban and peri-urban areas, to help cope with increasing urbanization.

Business Model

This business model is used where local water sources are contaminated and a piped distribution system that provides clean water is not in place. Contamination may include severe microbial pollution and high levels of arsenic, fluoride, iron, or nitrate, which may render simple, low-cost solutions (such as pumping, water harvesting, filtering through individual filters, or using chlorine tablets) ineffective.

Components of the Model

The structure of the model varies across enterprises and organizations. Some models (such as that depicted in figure 15) construct treatment plants near ground or surface water, which it then extracts, purifies, packages, and distributes to local customers. The location of the plant (and acquisition of the land required) is determined in collaboration with the local government. Other enterprises (such as the Safe Water Enterprise in Kenya) use membrane-based treatment of water.

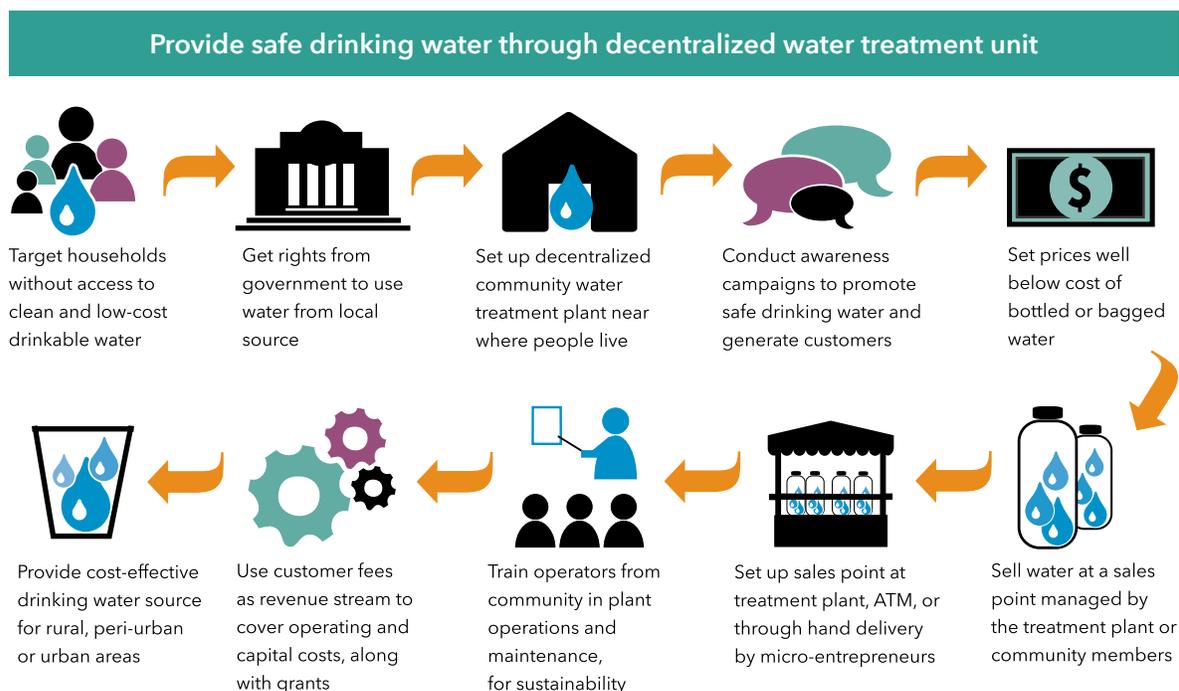
Different enterprises have developed innovative methods of treatment, often relying on alternative and renewable sources of energy in areas where electricity is not available. Water treatment facility can be run on solar power, reverse osmosis, or the power of gravity.

The nature of water contamination often determines the type of treatment technology required, which may have cost implications. Microbial contamination, for example, requires only a low-cost tank and chlorine treatment, whereas high levels of arsenic, fluoride, or nitrate require more sophisticated treatment processes.

Most customers of decentralized water treatment models are households. Local schools, offices, and other institutions also use the systems.

Some companies provide customers with containers (the design of which plays an important role in product marketing), disinfecting them at every visit to the store or plant for water refilling. Others regularly disinfect customers' own containers.

Figure 15. Providing safe drinking water through decentralized water treatment units



Many organizations involve local communities and entrepreneurs in creating distribution networks and sales forces, generating local employment and contributing to economic growth. Customers who live near the plants usually pick up their water themselves. Customers farther away often have their water delivered, by bicycle or moped. Some customers purchase water through automatic teller machines (ATMs)—cloud-managed, solar-powered, cashless, vending machines that provide clean water 24 hours a day to customers using prepaid cards.

Cost Factors

Decentralized water treatment solutions incur two main types of costs: the initial capital expenditure of building the plant and the operational cost associated with managing and maintaining the plant, the distribution network, and sales. The upfront capital cost can be funded through government, a donor grant, or an investor (such as an impact investor), based on the cost-recovery aspect of the model funded. In some models, governments fund the plant construction, recuperating their investment over time through the subsequent sales of water. In others the emphasis is on keeping the price of water as low as possible in order to reach a large number of beneficiaries. In these models, revenues cover operational expenses only (labor, spare parts, consumables [such as chemical substances required in the treatment process], and energy).

Revenue Streams

The main source of revenue is the sale of drinking water. Additional sources could include sales of water containers, charges for home delivery, and sales of retail products for small-scale treatment, such as chlorine tablets, or other products for treatment at a larger scale.

Financial Viability

Most decentralized water treatment models aspire to operate as financially sustainable for-profit businesses. Financial viability depends partly on the nature of the contamination and the process of purification required.

Revenues from the sale of water and other services are designed to recover operational and in some cases capital expenditures. Recovery of capital expenditures can take from just a few years to 15–20 years (Safe Water Network 2014).

Many organizations face financial challenges. Low prices of water keep profit margins very low, especially where maintenance and operation costs are high. To increase revenues, many enterprises offer services to urban and semi-urban areas at higher prices, to cross-subsidize their rural sales.

Partnerships

Water treatment enterprises need to work very closely with the communities they serve. Strong community involvement increases transparency and helps raise awareness and trust in the company's product.

Many enterprises recruit and train people from local communities to manage and maintain the plants as well as distribute and sell the final product. Some models put the water utility in community ownership and appoint local entrepreneurs to handle day-to-day management. Others lease the asset to local entrepreneurs through a franchising scheme and share revenues with them. Still others control water quality and manage collection of payments while putting the community in charge of operating the treatment plant. In this model the community provides the land, energy, and water.

Another critical partner national and local governments, which can provide grants and other sources of funding, including subsidized leasing of land. Every water provider must comply with national water safety and health standards and have a license to extract from a given water resource.

Some organizations partner with NGOs, hospitals, schools, and colleges to raise awareness about health benefits of drinking safe water to help create demand.

Implementation: Delivering Value to the Poor

Awareness

Many enterprises create and raise awareness about the health and other benefits of drinking clean and safe water, sometimes in partnerships with local institutions. Activities include information campaigns in collaboration with local authorities and NGOs and lectures at local schools. Awareness-building is particularly important in regions where the harmful consequences of consuming contaminated water are not immediate. Where NGOs once provided water for free, the new requirement to pay may need to be explained.

Acceptance

Water providers win acceptance among customers by engaging local leaders, partnering with the community, employing local people, and keeping prices affordable. As in many other areas, people at the bottom of the pyramid often spurn goods and services designed, branded, and marketed “for the poor.” In rural communities expensive national and international brands of bottled water are often considered signs of high social and economic status. Accordingly, decentralized water treatment enterprises strive to be perceived as providers of a better and healthier life and higher social status, sometimes selling water in attractive, clean, and reusable containers in order to compete with products sold by the bottled water industry.

Accessibility

Decentralized water treatment centers are located close to the communities they serve. Customers pick up their water at the plant, at an ATM, or at a local retail store, or they can have it delivered to their home. Water sales points must be located in areas with a sufficiently large customer base and/or traffic. By generating employment within poor communities, water treatment enterprises can provide access to other goods and services that may not previously have been available to some community members.

Affordability

Decentralized water treatment solutions are much more affordable than extension of piped water infrastructure. They are therefore a good solution in many developing countries. Treated water is priced based on many factors. The price has to be lower than that of expensive bottled water and low enough to be affordable to a critical mass of poor customers so that revenues earned are sufficient to cover operational and other costs

Results and Cost-Effectiveness

Scale and Reach

Community-managed decentralized water treatment systems are serving millions of people around the world. India alone has an estimated 7,000–12,000 water treatment systems in 2014. In 2012 WaterHealth, a social enterprise with operations in South Asia and Sub-Saharan Africa, had 500 sites reaching more than 5 million customers. In India the company's customer base rose from 15,000 in 2009 to more than 1.4 million in 2011 (Waterhealth International, IFC Case Study). The social enterprise Naandi Foundation will soon be providing more than half a million people with safe water through its 400 operational plants across 14 states in India.

The model is highly effective in reaching people with no options other than drinking contaminated or expensive bottled water. Some challenges remain in terms of reaching the very bottom of the pyramid, however. In the Naandi Foundation's catchment area in India, for example, 10 percent of households still cannot afford its products (Kumar and Muckerjee 2014).

Improving Outcomes

Virtually all of Waterlife's customers in rural areas have seen improvement in their overall health, leading to lower expenditure on medicine and healthcare (WBG/DM Case Study of Waterlife India). Data from a public health center in Madavganfarata, Maharashtra indicate a 65 percent decrease in diarrhea, a 57 percent decline in urinary stones, and a 57 percent drop in skin diseases in the district where Waterlife operates. Average monthly savings as a result of decentralized treated water was USD 28 for rural households and USD 15 for urban households (IFC 2013). The provision of clean water also cuts down on the need to boil water, reducing indoor pollution and fuel costs.

Just providing clean water is not sufficient to improve health outcomes, however. Clean water can get easily decontaminated once purchased. It is therefore necessary to periodically sanitize containers used for water transfer and to raise awareness regarding hygienic practices, such as hand-washing and safe water storage (Cherunya and others 2015).

Access to safe water makes people healthier and better able to work and attend school. It reduces the need to fetch water from resources located far away, a function usually performed by women and girls. Through emphasis on community ownership and management, the models support local entrepreneurs and retailers and generate employment.

Cost-Effectiveness

The cost of providing water through conventional pipes in India is USD 0.25 per month per household for unlimited volume plus USD 8 million for infrastructure expansion (WBG/DM Waterlife Case Study). Under the Waterlife model, the cost is USD 0.0004 per liter (to

the customer) and USD 60,000–65,000 (the more expensive option runs on solar power) for construction of the treatment plant (IFC 2015).

In many countries it may take years to expand water pipelines to remote areas. In contrast, a decentralized water treatment system can take as little as 45 days to set up.

Scaling Up

Challenges

Decentralized water treatment plants face several challenges—and opportunities—in reaching scale. In many areas with access to free but polluted water, it may take considerable effort to build awareness about the long-term negative effects of drinking unclean water, especially where the consequences are not immediately apparent, as is the case with water polluted by arsenic. Local communities may be used to receiving free water from NGOs or other development actors, a model that is not financially sustainable. To address these issues, social enterprises often form partnerships with local authorities, schools, and other institutions respected by the communities to launch information campaigns.

To keep distribution cost low, it is important that treatment plants be located in dense areas with easy access to customers. To reach more remote areas, services can either be cross-subsidized by operations in dense or urban areas (where higher prices are charged) or subsidized directly by the government.

The availability of skilled personnel to manage, operate, and maintain the plant is often a limiting factor. Some organizations have built recruitment and training of local people into the core of their models, generating employment in addition to providing safe drinking water.

Role of Government and Public Policy

Government can support the scaling up of decentralized water treatment solutions in several ways. It can address public perceptions regarding water quality and health hazards, ensuring the population that it is safe to drink and use the locally treated water. It can adjust governance structures according to financing strategies and establish clear relations (roles and responsibilities) among stakeholders, including municipalities, property owners, and social enterprises. If necessary, the government can reform existing (or create new) institutions to maintain relations among stakeholders and monitor water quality and uses. It can adjust the regulatory framework at various levels. In Kenya, for example, the Water Act of 2002 created a “delegated management model,” which provided criteria for small-scale private water providers to be formally recognized and therefore subject to regulation.

Most decentralized water treatment models depend on public funding. Governments can access new sources of financing for water development projects in various ways. They can capture the value of the land through a land value tax in which a proportion of the increased value that accrues to landowners benefiting from new or improved infrastructure is captured

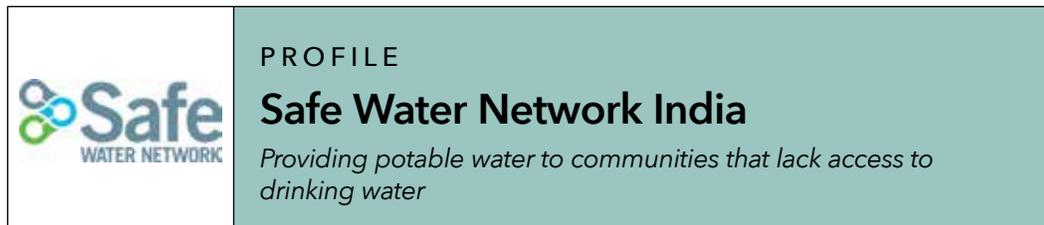
Table 27. Social enterprises: Providers of decentralized water treatment

<i>Company</i>	<i>Country</i>	<i>Description</i>
Grameen Veolia Water Ltd.	Bangladesh	Built filtration plants in five low-income communities and connected them to network of water taps. Plants are run as businesses, aiming to cover all operating expenses.
Naandi Foundation	India	Operates more than 400 mini-water purification plants in mainly rural communities, financed through public-private partnerships. Model is based on Design-Build-Operate-Transfer concept, whereby community ends up operating plants and Naandi is responsible only for monitoring and quality control.
Safe Water Enterprise	Kenya	Equips small kiosks with mobile SkyHydrant water filters, which remove suspended solids, bacteria, and viruses from water with hair-thin membrane fibers. Filtration process operates without electricity, requiring no grid connectivity.
Safe Water Network	Ghana and India	Has provided more than a quarter of a million people in Ghana and India with access to safe water, by working with communities. Provides training, tools, and support to ensure that system is locally managed and operated.
Sarvajal	India	For-profit social enterprise (part of Piramal Enterprises) operates community water filtration plants through local franchisees in Indian villages of about 5,000 inhabitants. Is experimenting with water distribution through ATMs.
Water Health	Bangladesh, Ghana, India, the Philippines	Uses new technologies (including UV light disinfection) to purify any available local water source. Centers employ local workers to maintain, test, and dispense water at affordable prices. Investment of just USD 25,000 (less than USD 10 a person) provides a typical community in India with its own WaterHealth Center and service for 10 years.
Waterlife	India	Provides clean water to households, apartment complexes, and offices in underserved and challenging areas, operating in partnership with the government, NGOs, panchayats, self-help groups, commercial institutions, and international agencies. Hallmark of model is focus on quality by providing reliable service and maintenance.

and used to fund the infrastructure provided. They can capture the value added by the decentralized water systems by issuing land-based bonds (with the land as collateral). They can attract private financing from engineering firms that build and service water systems or from landowners, owners of houses, and land and housing developers (in Mexico housing developers are the second-largest investors in water supply and sanitation after the federal government). They can also leverage private finance through public-private partnerships.

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Challenge

Some 97 million people in India lack access to safe water, according to the World Health Organization. Three-quarters of India's surface water is contaminated by waste, and groundwater often contains high levels of fluoride, nitrate, and other mineral contaminants. Water- and sanitation-related illnesses account for 70–80 percent of the country's disease burden. The challenge is to provide safe drinking water at an affordable rate to low-income communities.

Innovation

Safe Water Network was co-founded in 2006 by the actor and philanthropist Paul Newman. Although it is a nonprofit organization, it is based on market principles and a customer-oriented approach.

In 2008, the organization launched its first effort, a rooftop rainwater harvesting program that built or refurbished more than 1,000 community and household cisterns. Soon after, it set up water treatment and sales points. These Safe Water Stations (locally called iJal Stations) are equipped with water treatment technology to treat groundwater contamination in affected areas.

Sites for Safe Water Stations are identified based on the following criteria:

- Water quality is very poor.
- Households demand and are willing to pay for safe drinking water.
- The community has at least 400 households, and at least 75 percent of households are likely to participate. (If half of the population buys water regularly, the program needs at least 2,000 people in 500 households to be financially viable.)
- A local elected body has the authority and is willing to sign a tripartite agreement with Safe Water Network and the local operator giving Safe Water Network the right



iJal stations like this one in the village of Peddapur, in Telangana, provide residents with relatively inexpensive clean water.

to operate. The agreement includes a mechanism for setting an affordable but viable price for water and ensuring equitable access to all community members.

In consultation with the community, a local entrepreneur or community-based organization is selected to operate the water station. Safe Water Network selects the most appropriate water treatment technology, provides the funds for capital investment, builds the station, and subsidizes the marketing costs.

All stations are equipped with a remote monitoring system that enables 24/7 monitoring of plant performance and water quality. Monitoring enables technical issues to be addressed by the project team immediately, keeping downtime to less than 2 percent. Each station is expected to cover its operational costs from the start. The local entrepreneur, while setting aside some percentage toward plant maintenance, earns fixed fees from the water sales, and the balance is returned to Safe Water Network. Safe Water Network uses its revenues toward plant repayment and is used as a revolving grant to invest in other communities. It takes about 7–8 years to recover the costs of setting up a station. If a station proves nonviable, either operationally or financially, Safe Water Network has the right to terminate operations and relocate the treatment plant.

Impact

Safe Water Network India has brought access to safe, affordable drinking water to more than 672,000 people through 180 iJal Stations in the states of Telangana, Uttar Pradesh, and Maharashtra (2017), having doubled the number of its stations in just the past couple of years.

Water is priced to make it as affordable as possible while covering operating costs. In 90 percent of communities served, it sells for USD 0.06–0.08 per 20 liters—a fraction of the USD 1.20 charged for the cheapest branded bulk-packaged treated water. iJal water is also less expensive than untreated water from tankers or boreholes.

Education about the health benefits of properly treated water is part of the model, particularly in areas where dissolved minerals have contaminated the water. Education is also necessary to counter the belief that boiling water can make it safe to drink.

Safe Water Stations generates livelihoods for local station entrepreneurs, operators, and drivers who transport the water. They also provide training on how to manage a small business.

Scaling Up

The main external driver of this model is the vast unmet demand for safe drinking water. Safe Water Network in India and Ghana have reached nearly a million people (2017). Five variables drive the financial viability of individual stations: the population of the community, household size, household participation, distribution, per capita consumption, and most critically, willingness to pay.

Internally, two drivers underpin design and scale-up: cost reduction and a commitment to sharing knowledge. The network keeps costs low by using technology and limiting its staff to a small team—half of which are for awareness raising and knowledge dissemination, an important part of the company's social mission and also improves willingness to pay.

While the Indian government has become more involved in procurement of decentralized water treatment plants, its focus on the lowest price, without incorporating quality and social impacts, limits the network's ability to win public sector contracts.



Challenge

More than 3 million people in Ghana lack access to an improved water source. The country's large chemical, mining, and agriculture industries have led to severe arsenic, mercury, and cyanide pollution, as well as microbial contamination. Expensive water treatment solutions are needed to filter the water to make it safe for drinking. In addition, many parts of the country lack basic water infrastructure. The challenge is to provide safe drinking water at an affordable rate to low-income communities.

Innovation

WaterHealth International (www.waterhealth.org) has been operating in Ghana since 2008, using a build-operate-transfer model based on management contracts of 20–25 years. Once WaterHealth builds a center, it contracts it out to a local community or agency to operate and maintain for a period of time. Its unique UV treatment technology and innovative business model make high-quality, potable water affordable to households earning just USD 2 dollars a day.

The plant sells both “utility water” (used for washing and cleaning) and potable water. Their “Dr Water” branded product is consumer friendly to encourage widespread adoption. Utility water costs USD 0.05–0.08 per 20 liters. This water is filtered to safe drinking water standards but does not go through the final reverse osmosis process. Drinking water can be collected from the plant (at a cost of USD 0.20 per 20 liters) or delivered to homes (at a cost of about USD 0.50 per 20 liters).

WaterHealth reaches areas where it is not profitable or feasible for traditional water utilities to operate. Its system is flexible, as units of various sizes can be installed. Smaller treatment units cost USD 50,000 to equip and install; a large unit can cost up to USD 90,000. The plants are manufactured as kits that can be easily assembled and maintained



Water treatment plants like this one in the Greater Accra region are manufactured as kits that can be easily assembled and maintained by local workers.

by local workers. Waterlife owns and operates the center, then transfers it to the community after 20–25 years.

The local authority (a village chief or district council) provides the land, access to electricity, and rights of access to the water source. WaterHealth employs and trains staff who run the center and helps the local community set up a water board to liaise between the community/users and those that run the water center to ensure a smooth operation and transition to community ownership at the end of the contract.

Several centers are developed at the same time in villages that are close to one another, in order to ease replication and allow efficiencies in management services across the centers. WaterHealth tests the water regularly and maintains the unit, using revenue from the water center to do so. It achieves break-even on operational costs in four to six months. To be fully sustainable, the unit needs to serve a population of at least 5,000 people.

Impact

WaterHealth provides 250,000–300,000 people in Ghana with access to clean drinking water treated at 35 plants. Each plant typically serves about 10,000 people—significantly more than bore wells, which provide just 300–500 people with access to unfiltered water.

Although WaterHealth initially worked in rural areas, 50–70 percent of its new facilities are in peri-urban or urban areas, where demand from people living in informal or unplanned settlements is growing.

An independent review of the cleanliness of a sample of water from WaterHealth plants showed that at the treatment center, WaterHealth water had 93 percent less *E. coli* contamination than surface water (Opryszko and others 2015). However, as water quality degrades after it leaves the plant (due to contact with unclean hands, the mixing of surface water with clean water, and contaminated storage vessels)-- WaterHealth also chlorinates some of its water in at-risk areas.

Scaling Up

Grants of USD 4.5 million from the Coca-Cola Africa Foundation and the Diageo Foundation have allowed WaterHealth to expand its activities. Access to finance for capital investment and partnership support from local government will determine future growth. Support from local government is also needed as the system complements public provision. Constraints to scaling up include lack of access to land, as water centers need to be in a central place to ensure sufficient customers, and lack of relevant skills in the workforce in Ghana for employees to maintain the water filtration systems.

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Meeting the Sanitation Needs of the Poor with Serviced Toilets

Waterless toilets provide a sanitary solution to people in urban and peri-urban communities who are not connected to the sewerage system

HIGHLIGHTS

- Waterless and diverting toilets offer improved sanitation options suited for unserved urban slums.
- Aspirational name, branding, and design help make toilets attractive for users.
- Low costs and innovative payment models make units affordable.
- Waste is removed in portable containers and often used to make fertilizer or briquettes.



Summary

Millions of people at the bottom of the pyramid live in communities that are not connected to the sewerage system. Most of them use pit latrines or engage in open defecation. To address the problem, dozens of social enterprises have devised innovative toilets that require no water. These low-cost in-home or community units represent a huge improvement over unimproved sanitation and create jobs for people who install and service them.

Development Challenge

Most of the world's population—almost 4 billion people—now live in cities. The pace of urbanization has been most rapid in developing countries and emerging economies, where it has helped create deep pockets of urban poverty. According to the World Bank, more than a

third of people living on less than USD 2 a day reside within city perimeters and UN-Habitat estimates that at least 40 percent of urban dwellers worldwide live in slums (World Bank 2013)

Globally, urban sanitation coverage stood at 82 percent in 2014. It was only 40 percent in low-income countries, 40 percent in Sub-Saharan Africa, and 64 percent in South Asia (World Bank 2016).

Lack of sanitation infrastructure is one of the greatest barriers to increasing access to basic sanitation services. In dense urban areas where there are no public sewerage connections, traditional options—pit latrines, “hanging toilets,” “flying toilets,” and open defecation—are unsanitary. Pit latrines in urban areas fill up rapidly, are poorly maintained, and are often emptied by hand by unprotected workers. Hanging toilets—makeshift structures placed over a moving water stream—dump untreated waste into water bodies. Flying toilets are plastic bags that are filled with excrement and then thrown as far away as possible.

All of these options spread disease. More than half of the hospital beds in Sub-Saharan Africa are occupied by patients with preventable diarrheal diseases (UN Water 2008). Open defecation also exposes people to shame, ridicule, and, in the case of women and girls, danger.

Improved sanitation has huge health benefits. But the benefits go beyond health. Healthy children are more likely to attend school (girls in particular are more likely to go to and stay in school if the school is equipped with a toilet for girls). Improvements in sanitation also protect water resources, keep rivers and coastal seas clean, and reduce the degradation of productive land and fisheries.

Serviced toilets are compact toilet units that can be used in homes and communities without access to centralized sewerage systems. Clients usually pay for using the toilets but do not own them. The company that owns the toilets empties them, treats the waste and converts it into fertilizer or fuel.

Business Model

Under a typical serviced toilet model, the enterprise supplies and installs the toilet and evacuates and often processes the waste. For community toilets, local franchisees or operators usually service the toilets, keep them clean, collect fees, and sell other services at the toilet site. Ecotact in Kenya, for example, operates “toilet malls,” which also serve as retail outlets for basic necessities such as prepaid mobile cards, snacks, and shoe cleaning services (Karugu 2010).

Components of the Model

Some companies produce the toilet units themselves, others purchase them from domestic or foreign suppliers. The units are then either rented or sold to franchisees and installed in the household or public space. The toilets come in various shapes and designs (squat plate or sitting). Waste is stored in containers in the ground and then evacuated into portable containers (one to four times a week for home units, daily for community toilets). Most toilets

Figure 16. Features of the serviced toilets business model



are designed to channel solid and liquid waste into different containers, which reduces odor and facilitates waste processing. Chemicals and sawdust are also used to reduce odor. Once removed, the waste is brought to a local waste treatment plant or processed at in-house facilities. (Some enterprises collect and treat waste on site, using chemicals. That model is not covered here.) Some companies use the recycled waste to produce goods, such as fertilizer (Sanergy) and charcoal briquettes (Sanivation). Figure 16 depicts features of the model.

Cost Factors

Toilet design and construction are funded through capital investment (at least initially), which comes from public authorities (domestic or foreign) and/or private investors and philanthropic organizations. To keep the cost down, construction often takes place in-house, using locally available materials and workers from the local community. The number of users and their location density determines the cost-efficiency of distribution and servicing networks. Toilet installation and evacuation/servicing is usually covered by user fees to ensure affordability of the sanitation services. Depending on individual model, waste processing is covered through external grant/investment, user fees, or through revenues generated by sales of the recycled product.

Revenue Streams

Revenues come from two main sources: user fees and the sale of goods produced from treated waste. Some companies also sell or rent the toilets themselves, although most provide them for free, charging only for servicing. Some community toilets generate additional revenues from the sale of other goods and services, similar to those offered at convenience stores.

Users pay for use of a clean and serviced toilet either per month (for installation and use of a household toilet) or per visit (for use of a community toilet). Some models set prices based on willingness to pay surveys, sometimes reducing prices in response to lower demand or customer feedback. Some community toilet models leave it to the toilet operator to set prices, so that operators can offer services that are priced competitively in different areas.

Financial Viability

Given the availability of free, albeit unsanitary, options such as open defecation and latrines, there is heavy pressure for enterprises to keep prices low. Scale is critical to achieving financial viability, particularly at the franchisor level.

All models analyzed required initial financial and/or technical support; many pilots were fully grant funded. The businesses plan to eventually break even, however. Clean Team in Ghana expects to reach breakeven at 1,500 toilets installed at each central processing facility; X-Runner in Peru estimates that production of 1,500 toilets would allow it to cover all its costs. In some models development of a second revenue stream from the sale of processed waste byproducts is key factor in achieving financial sustainability. Companies take time to break even. In contrast, individual franchisees can start earning profits on their investments in about six months.

Partnerships

Models are set up and run by a mix of private companies, social enterprises, NGOs, local entrepreneurs, and, in some cases, local government agencies. These organizations play three key functions: supplying and installing the toilet, servicing toilets and serving clients, and disposing off and/or using waste.

Sanergy supplies prefabricated toilets and evacuates and processes waste. Its sister organization (a nonprofit called Fresh Life) operates the toilet network, provides training, and supports more than 300 local entrepreneurs, who earn steady incomes from their business. Local municipalities may get involved in waste management in models that dispose of the waste at local plants.

Implementation: Delivering Value to the Poor

Awareness

Companies' marketing strategies vary, leveraging positive and negative incentives. Positive incentives focus on hygienic toilets as an aspirational product. Clean and attractive design is an important feature for this message. Interestingly, promotion of the health benefits associated with improved sanitation is not necessarily a primary objective of the outreach strategy of many companies. Although some businesses have set up operations in areas where NGOs are actively promoting hygienic practices, others distance themselves from such awareness-raising campaigns, which are perceived as “NGO-talk” and not directly relevant to the business brand and bottom line (Hystra 2014). Negative incentives focus on promoting behavioral change through peer group condemnation of open defecation as an antisocial behavior. Ecotact's strategy in Kenya, for example, is based on such model of community-led sanitation (Karugu 2010). Promotion is handled mainly by sales agents at community events, through education in schools, and by word of mouth.

Acceptance

Customer feedback indicates that the safety, dignity, and cleanliness of the toilet and the surrounding areas are highly valued. Convenience is also an important driver of usage. The fact that serviced toilets are compact and can therefore be located in the heart of densely populated areas is a major advantage (Narracott 2013a). Branding plays an important role in building acceptance. To maintain it, franchisors close down franchisees that do not adhere to their standards. The fact that community members service the toilets helps drive adoption.

Accessibility

The toilets can be assembled on-site and placed inside or close to homes. They can be located in densely populated areas because portable waste containers can be carried by hand or wheelbarrow (obviating the need for access to roads).

Affordability

Public toilets are very rarely free, even when operated by the government or a charitable organization. Many people in developing countries are thus used to paying for toilets. Typical serviced toilet clients are slum residents with regular and predictable incomes, ideally with a separate space available where to install the toilet (such as a small courtyard or a separate room).

Results and Cost-Effectiveness

Scale and Reach

Serviced toilet companies target slum residents who have some disposable income. Some entrepreneurs who serve the bottom of the pyramid argue that in order to set up a sustainable business, companies need to start with the most profitable segment of the unserved market—more affluent households in low-income areas. Once business systems are functioning well, the businesses can innovate to bring costs down to serve customers farther down the income scale (Narracott 2013b).

The level of maturity of businesses and the numbers of people reached vary widely. Some pilots, such as Banza, Sanivation, and X-Runner, have fewer than 100 toilets each. Other community models operate several hundred toilets, reaching thousands of people a day (Sanergy, for example, operates more than 700 toilets, serving 31,000 users a day, World Bank 2015).*

Improving Outcomes

The scale of operations is still too small to have a measurable effect on community or child health, as measured by such indicators as parasitic infection, diarrhea, and stunting. Service toilets have had an impact on individuals' lives, however. All models examined in this study cite consumer satisfaction and increasing demand. "Fresh Life Operators"—people in informal settlements in Kenya who work for Sanergy—report having created a cleaner local environment. Schools with Sanergy toilets report higher student attendance. Women using Saraplast toilets report greater security and dignity. Serviced toilets have also had a positive impact on operators' lives, generating revenue and employment. In the slums of Makuru and Mathare, in Kenya, for example, 321 residents now work for Sanergy as Fresh Life Operators, earning about USD 10 a week.

Cost-Effectiveness

Serviced toilets offer a cost-effective form of sanitation in places without public sewerage systems. Monthly household payments range from a few dollars (for daily usage of a community toilet) to USD 20 (for higher-end household toilets in certain regions) (table 28). Such expenditures represent a sizable portion of a poor household's monthly budget and about 5 percent of total income. (Sy, Warner, and Jamieson 2014).

A survey of 600 households in informal settlements in Bangalore, Delhi, and Pune, India revealed that half of all households were willing to pay for bathing and washing facilities. Willingness to pay across the three cities ranged from USD 0.70 to USD 1.90 a month—more than respondents were spending on existing facilities. Willingness to pay was not

* Companies such as Saraplast and DMT, which serve construction sites and public events, operate several thousand toilets. These figures are not considered here because these companies do not focus on people at the bottom of the pyramid.

Table 28. End-user costs of selected serviced toilet models

<i>Company</i>	<i>Country</i>	<i>Description</i>
Household toilets		
Banza (Kenya)	USD 1.75 for households, USD 3.50 for institutions	Cost is twice the cost of a basic public toilet, about the same as an electricity bill, five times more than weekly garbage collection, more than three times more than public tap water (Hystra 2014).
Clean Team (Ghana)	USD 10-20, depending on frequency of service	Monthly public toilet fees for household of two adults and two or three children would run USD 3-8.
Sanivation (Kenya)	USD 7	Servicing is biweekly.
SOIL (Haiti)	USD 5	Cost represents about 5 percent of household income. Regular public toilet use costs USD 1.50-2 a month. Price set based on initial surveys on willingness to pay. People pay USD 2.30-4.60 a month for cell phone usage (Hystra 2014).
X-Runner (Peru)	USD 14 for removal of waste and provision of sawdust (an odor neutralizer)	Cost is equivalent to 3 percent of average household income (Hystra 2014).
Community toilets		
Bio-Centers (Kenya)	USD 1.50	Fee is USD 0.05 per household per day. Weekly or monthly pricing with unlimited access for all household members is available. Packages also offer water, bathing, and cooking fuel (Unmande 2015).
DMT (Nigeria)	USD 46.50	Fee is USD 0.31 per visit (Iwuoha 2013).
Ecotact (Kenya)	USD 9.50	Fee is USD 0.063 to use toilet and USD 0.125 to take a hot shower (Karugu 2010).
Sanergy (Kenya)	USD 6	Toilet franchisees set fees. Recommended price is USD 0.03-0.05 per visit (phone interview with Medora Brown, communications manager, Sanergy, April 2015).

Note: Some models (such as SOIL and Sanergy) offer both household and community solutions. They are categorized here based on their primary focus.

directly correlated with income (Sinroja 2013). Thus, there exists a substantial opportunity in the market for serviced toilets.

Scaling Up

Challenges

Clients have shown their willingness to pay a premium for improved sanitation. Sanergy, which operates in Kenya, reports that customers rarely leave. The challenge is to acquire

customers in the first place. Sanitation expenditure remains a low priority for many low-income households (Sy, Warner, and Jamieson 2014). A study for SOIL in Haiti found that people are willing to pay more for their monthly cell phone bills than for improved sanitation (Hystra 2014).

Achieving financial sustainability is another critical challenge many companies face when scaling up the serviced toilet solutions. On the cost side, the toilet design and servicing can be prohibitively expensive (for instance, some models use imported chemicals to reduce odor, which is required primarily in tropical climate with very warm weather). Further, the waste treatment can be an expensive process as well. Finally, companies may face marketing and sales difficulties when trying to sell products made of recycled human waste matter. The waste briquettes made by Sanivation in Kenya, which burn longer and at lower temperature, have found a niche market in BBQ restaurants.

The serviced toilet model, as it involves complex logistics for distribution, sales, servicing, and cash collection, requires a certain degree of client/population density—and therefore is currently restricted to urban and peri-urban areas.

Role of Government and Public Policy

Given the health and environmental externalities serviced toilets yield, there is a strong rationale for the governments to support this model. In fact, only a small number of governments have been directly involved in a setting up build-operate-transfer models of community toilets. Under this model, a private contractor builds a toilet on land provided by the government, operates it for a number of years, and then turns it over to the municipal councils for management or leasing out.

Governments can help scale up serviced toilets in several ways. One is by providing information. They can initiate and support awareness-raising campaigns promoting sanitary practices, in partnership and collaboration with civil society institutions, NGOs, and schools. They can use public data and information to provide market intelligence, identifying areas where the water table is so high that pit latrines are problematic but serviced toilets would be more appropriate, for example. They can help foster cost savings throughout the value chain by reducing tariffs on chemicals and other substances and/or providing subsidies to reduce the cost of toilet production.

Public resources can also be used to support waste treatment. Alternatively, the government could simplify the process by which companies are authorized to sell products made from human waste. Sanergy, for example, can produce fertilizer from bio-waste, but it has not been able to sell its products because it has not yet received government clearance to do so. For their part, companies should enter into public-private partnerships and/or focus more sharply on evaluating and demonstrating the public benefits from increased access to sanitation, in order to make themselves eligible for government grants.

Table 29. Social enterprises: Serviced toilets

<i>Company</i>	<i>Country</i>	<i>Description</i>
Banza	Kenya	Manufactures compact, waterless, portable toilets with biodegradable bags for collection of waste. Banza rents the toilets to its customers and services them daily for a fee. Bags are currently disposed of in the main sewerage line, with permission from local authorities, but Banza is developing partnerships with organizations (such as Sanergy) that can treat and process the waste. Biobags are expensive, as they are imported.
Clean Team	Ghana	Charges monthly subscription fee for in-house portable toilet with waste collection service two to four times a week.
Dignified Mobile Toilets (DMT)	Nigeria	Rents and sells mobile public toilets for events, construction sites, and other commercial uses; franchise model to rent toilets to microentrepreneurs in low-income communities. Advertisements on outside of facilities provide additional source of income.
Eawag, EOOS, and Makerere University	Uganda, Kenya	Works with local franchisees from low-income communities as salespeople to rent toilets to households, landlords, and communities. Local franchisees also collect the waste and transport it to off-site resource recovery plants, where it is converted into fertilizer.
Ecotact	Kenya, Tanzania	Runs Ikotoilet, which builds and operates blocks of public pay-per-use sanitation facilities. Each block contains a toilet, shower facilities, shower taps, soap, tanks for rainwater harvesting, taps with treated drinking water, baby changing areas, and trash cans, as well as shops and a shoe shiner, to create a central meeting place. Local governments provide land in urban centers to make project affordable and part of the community.
Eram Scientific Solutions Pvt. Ltd.	India	Produces compact electronic public toilet using mobile technologies to control entry, usage, cleaning, payment, and remote monitoring. Solar panels can be built in to treat waste biologically on site, without electricity. Advertisements on outside of units provide additional source of income.
Peepoople	Kenya	Produces Peepoo, a single-use, biodegradable, self-sanitizing bag for urine and feces that is easy to use when fixed to a small bucket or container.
Samagra	India	Works with franchisees who manage community toilets in slums through operators and cleaners. Users who pay monthly fee receive ID card that can be used at any Samagra toilet. Rewards program offered for users. Company also offers other services, such as phone recharging and savings accounts.
Sanergy Inc.	Kenya	Provides low-cost toilets to microentrepreneurs, who further rent/sell and service the units to the end customers. Waste is processed into fertilizer.
Sanivation	Kenya	Rents and services in-home solar-powered toilets, collecting waste once a week and bringing it to a local treatment site, where it is treated using solar power and turned into fuel briquettes. Briquettes are then sold as cheaper alternatives to charcoal for cooking and other uses at home. Company operates in refugee camps as well as residential communities.

Table 29. Social enterprises: Serviced toilets (continued)

Company	Country	Description
Saraplast	India	Manufactures portable restrooms made from recyclable materials and provides total sanitation and waste management services. Services cover installing restrooms in places like construction sites or cultural events and cleaning and treating sewage.
Sustainable Organic Integrated Livelihoods (SOIL)	Haiti	Rents portable, waterless, urine-diverting toilets for use in homes and public areas. Waste is treated centrally and processed into compost.
Umande Trust	Kenya	Operates 52 biocenters, which convert human waste into clean energy (biogas) and fertilizer for urban greening.
X-Runner	Peru	Rents mobile, water-free toilets to households and collects waste weekly, converting it into fertilizer.

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	<p>PROFILE</p> <h2>Clean Team Ghana</h2> <p><i>Leasing serviced ceramic household toilets to urban slum dwellers in Ghana</i></p>
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Challenge

Just 14 percent of Ghana's population had access to improved sanitation in 2012, the 10th lowest percentage in the world. In the country's urban areas, 72 percent of the population uses shared sanitation solutions, such as unhygienic public toilets, which often have long waiting lines, and 7 percent practices open defecation (WHO/UNICEF n.d.).

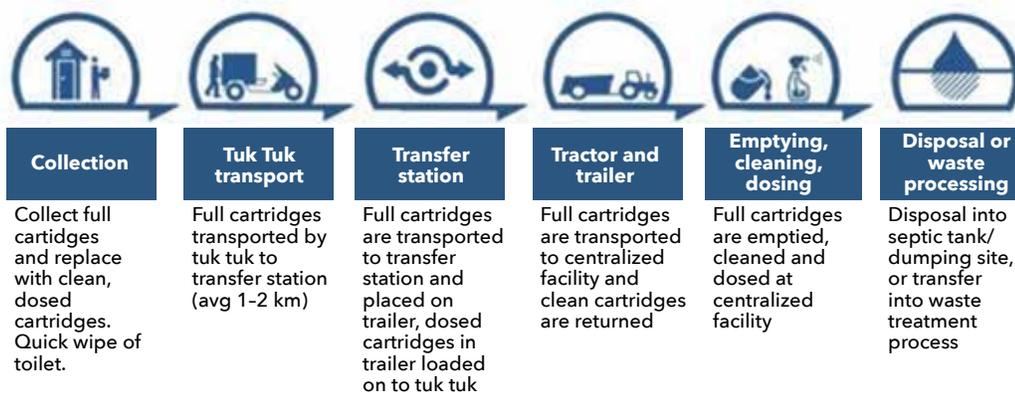
These sanitation methods can lead to health problems, leave women and vulnerable people open to sexual violence, and increase pollution of water systems and the urban environment. A key challenge is how to provide affordable, improved sanitation to people in slums that are inaccessible to large vehicles for waste removal.

Innovation

Clean Team (www.cleanteamtoilets.com) has developed a unique service-based model and urine diversion toilet for households and schools in urban Ghana. It rents toilets to customers based on a monthly subscription fee of 15 cedis (USD 10) per month, including twice-weekly emptying; this compares with up to 45 cedis per month for public toilet use by a 5-person family. This makes toilets accessible to the more affluent households in the target area who rent their homes and cannot make large investments. Based on market research, the toilets were designed to look like ceramic toilets and marketed as an aspirational good. Local staff go door to door selling the product and promoting hygienic sanitation practices. The toilets are delivered to people's homes. Clean Team collects the waste via tuk-tuks and transports it to a central facility, where it is stored before being transported to the municipal waste plant for treatment.



Clean Team toilets look like ceramic toilets, but they use no water. They are installed outside people's homes.



Source: www.cleanteamtoilets.com

Impact

As of May 2015, Clean Team had sold 990 toilet contracts, servicing 6,900 users in 28 communities in Kumasi, the capital of Ashanti. Among the company's customers are two schools. This market is perceived as having significant potential for growth.

Customers are the slightly more affluent households in the slum area, who have the means and space to rent a toilet. About half of customers state that they now spend less on sanitation than family members using public toilets. The other half report spending more but believe that the convenience of having a toilet at home is worth paying for.

The toilets are environmentally friendly—and highly suitable to the semi-arid area of Kumasi—because they do not use water. Since 2012 Clean Team has prevented 760+ tons of sludge from being deposited in the street, where it can pollute water ways and the urban environment.

Scaling Up

Kumasi provides a conducive environment for Clean Team's model because slum residents there have sufficient income to afford the service, a local waste treatment plan is accessible, and the local government is engaged in promoting sanitation. These factors affect where the model can scale and what further innovation is needed. Several external economic issues constrain the business model, including the high cost of land (on which to store waste before it is treated), the cost of fuel, inflation, and the unfavorable exchange rates against the British pound, which affects the cost of the imported toilet additive. An informed and educated staff—to promote the brand and ensure customer retention—are key to the business model, however finding and retaining them will prove more challenging as expansion moves outside major urban centers.

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	<p>PROFILE</p> <p>Sanergy</p> <p><i>Improving access to hygienic sanitation in informal settlements in Kenya through a systems-based approach</i></p>
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Challenge

Eight million residents of Kenya’s informal settlements lack access to improved sanitation. In urban areas, the main sanitation alternatives are shared toilet blocks, other unimproved solutions, such as “flying toilets” and open defecation. All of these alternatives increase the risk of spreading disease, are unsafe at night, and release untreated waste into the water system.

One of the key challenges in providing improved sanitation in informal settlements is safely removing waste in areas not connected to a sewerage system and often inaccessible to large vehicles.

Innovation

Sanergy (www.sanerg.gy) produces prefabricated, low-cost, high-quality, waterless toilets known as Fresh Life Toilets. It tackles the challenges of slum sanitation by producing toilets that are easily transported and assembled and collect waste in sealed portable containers. It builds its client base through aspirational branding and a network of local operators.

The company keeps prices low by processing the waste it collects and selling it commercially. A urine-diverting squat plate enables solid and liquid waste to be collected in two separate containers under the toilet. This separation reduces odor, which allows toilets to be located closer to people’s home than traditional toilets. Sanergy employees empty the containers on a regular basis. Using hand carts, they transport the solid waste to Sanergy’s central waste management facility, where it is processed into organic fertilizer and other byproducts for commercial sale.

The company operates three distribution models. It sells commercial toilets to local community members, known as Fresh Life Operators (FLOs), who run them as businesses. It sells residential toilets to landlords, who offer them as a value-add service to tenants



Workers remove the sealed portable containers that hold solid waste from a brightly colored Fresh Life Toilet in Nairobi.

living on plots housing 10–15 households. It sells community toilets to institutions (schools, clinics, and churches) that reach underserved populations.

The focus has been on the operation of commercial toilets by the network of FLOs in Nairobi's informal settlements. Individual FLOs set the prices they charge per visit, which average about USD 0.02 per child and USD 0.05 per adult. They build demand for the toilets, collect fees, and keep the toilets clean.

Sanergy trains the FLOs, who become franchisees, purchasing toilets and business services from Sanergy. For about USD 500, they receive their first toilet, business support services, and first year's servicing (the fee is lower for subsequent units). Kiva, the online microlending platform, finances their investment with 12- or 24-month loans. (Franchisees who pay cash receive a discount.) Once they own the toilet, franchisees pay an annual servicing fee of about USD 90.

Impact

Sanergy increases access to improved sanitation facilities in informal settlements, improving the health of residents and the urban environment. As of May 2015, five and a half years

after it was founded, the company has installed 1,000 Fresh Life Toilets in informal settlements, where the network is used about 50,000 times a day. It has safely removed and treated more than 10,986 tons of waste. Waste is also converted at a centralized facility into useful end-products such as organic fertilizer and renewable energy. Schools that have Fresh Life Toilets report that enrollment rates have risen by 20 percent, according to the company.

Sanergy creates jobs throughout its supply chain. It employs about 250 staff and has a network of 650 FLOs. In addition, some operators hire an employee to run daily business operations; Sanergy estimates that FLOs hire about 175 people.

Franchisees typically recover their initial investments within 12–24 months. Once they repay their loan, they can earn about USD 20 a week—almost as much as the average weekly income in Kenya.

Scaling Up

Cooperation of FLOs is essential to the business model for community toilets. Sanergy therefore invests time and resources training operators, gaining their feedback in regular meetings, managing their loans and telling their stories. Although a few struggle—and some have had their operations shut down because they failed to meet compliance standards—the vast majority remain engaged, driving the brand forward.

Sanergy engages engagement community councils and elders within the slums, in an effort to gain community support. It also works with county and national government officials on community health training, particularly in schools. In collaboration with WASH United, it launched a train-the-trainer curriculum for hygiene awareness in schools. Every school that receives a Fresh Life Toilet must participate in the training; schools that do not have Fresh Life Toilets are also welcome to attend.

The FLO model can be expanded incrementally, but it rests on community acceptance; it can therefore be challenging to introduce to a new target area. Alternative distribution models being developed—including working with schools and churches or groups of 10–20 households sharing a single toilet—may be easier to introduce to new areas.

Consumer adoption is critical. The toilet are designed for 100 uses a day, but many see fewer than 75 uses a day. A study of the program identifies two likely factors constraining use: cost and distance to the nearest Fresh Life Toilet (Esper, London, and Kanchwala 2013). Sanergy is investing in improving its understanding of consumer drivers and behavior patterns in order to address both issues.

Kenyans are used to paying for toilet services; community buy-in and creation of demand were therefore not key challenges in Kenya. Elsewhere in the world, where consumers are not used to paying for sanitation, more investment in awareness raising may be required.

Sanergy is exploring new ways to optimize waste collection and processing. The pace at which markets for waste products are secured will be a driver of success. The Kenyan Ministry of Agriculture issued a directive that favors organic fertilizer over chemical fertilizer. This move should benefit Sanergy, especially as very little organic fertilizer is produced domestically.

Reference

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Fresh Life

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SECTORAL BUSINESS MODELS

WASTE



Collecting Waste in Low-Income Areas

Innovative collection solutions for low-income, underserved areas include fee-based subscriptions, reward points, and

HIGHLIGHTS

- Provides private waste collection services to areas unserved by public-sector waste services and reduces burden on strained public-sector operations.
- Provides safer formal employment and livelihood opportunities to informal waste pickers and scavengers.
- Collection services reduce the negative impact on public health and environment degradation by adopting environmentally sustainable waste collection and disposal practices.



Summary

Centralized waste collection provided by governments is unable to keep pace with the rapidly increasing amount of waste generated in developing countries, leaving large portions of populations unserved. Lack of access to waste collection services leads to improper disposal of garbage, posing a threat to public health and the environment. Owing to limited budgets, governments of many developing countries struggle to incorporate densely populated and hard-to-access low-income informal settlements and slums within their scope of collection services. Funding for waste management activities is insufficient and typically diverted to serve richer neighborhoods (Blake 2009). This results in overflowing open dumps, poor quality air, and health hazards. The absence of an effective public waste collection system has led to the presence of a large number of informal waste-pickers, who are involved in collection and segregation of waste. These waste-pickers, who are from low-income communities, operate in unhygienic working environments, are unaware of safe or good waste

handling practices, undertake manual collection activities that may be dangerous and earn low incomes.

A number of enterprises offer innovative collection solutions to increase access of residential communities and businesses to waste collection services, extend reach to unserved areas by partnering with local municipal authorities and aggregating waste-pickers to enhance their productivity, incomes and quality of life.

Development Challenge

Waste generation is increasing in low and middle income countries; and estimates show that on an average, only a mere 36 percent of the population in low income countries have access to waste collection services (Wilson 2015). An approximate 2 billion people across the world are unserved (Wilson 2015), resulting in waste being discarded as untreated garbage on street sides and into water sources or burnt in open grounds, leading to an increase in public health and environmental pollution risks.

In developing countries, waste management is perceived to be a public service to be provided by the government at no cost to the waste generator. The lack of willingness to pay for these services makes it financially unsustainable for local municipal authorities to undertake efficient waste collection; reflected in lower investments in appropriate transportation and waste treatment technology. For example, only 60 percent of the 20,000 tons of waste generated per day in Peru is collected (Blake 2009). Areas inhabited by low-income communities and micro-businesses are unplanned, and often extremely congested, with tightly packed informal structures and narrow lanes. This makes it difficult for waste collection vehicles to navigate and reach waste bins and dumps. Since, these services are free, waste collectors lack the initiative to make the effort to reach these communities.

The unaddressed demand for collection services has led to the emergence of a large informal sector of waste collectors; the United Nations estimates that there are 15–20 million informal waste workers (Wilson 2015) across developing countries. Most of these countries tend to leave out informal waste-pickers from waste management policies, thereby failing to recognize the contribution made by these workers in waste collection and recovery activities and prohibiting them from entering the mainstream waste management value chain. For instance, it was only in 2006 that the municipal authority of Pune, India granted waste pickers the right to collect waste and charge a service fee from households (Gupta 2012). Still, in other countries such as Egypt, policies related to waste management do not recognize informal waste workers (Gerdes and Gunsilius 2010). It is estimated that in many cities across developing countries, the waste sector provides livelihood to more informal waste workers than formal waste workers (Gupta 2012). However, unsanitary working conditions and lack of protective equipment subject informal workers to greater health risks; typically, morbidity among waste pickers is higher than among formal waste collectors (Gupta 2012). In addition, waste-pickers in low-income countries are often subject to social stigma.

Business Model

Components of the Model

Several enterprises now complement government collection services and provide residential and community level waste collection services. Some enterprises leverage the informal sector of waste-pickers and aggregate them with a view to enhance their productivity and livelihood (figure 17).

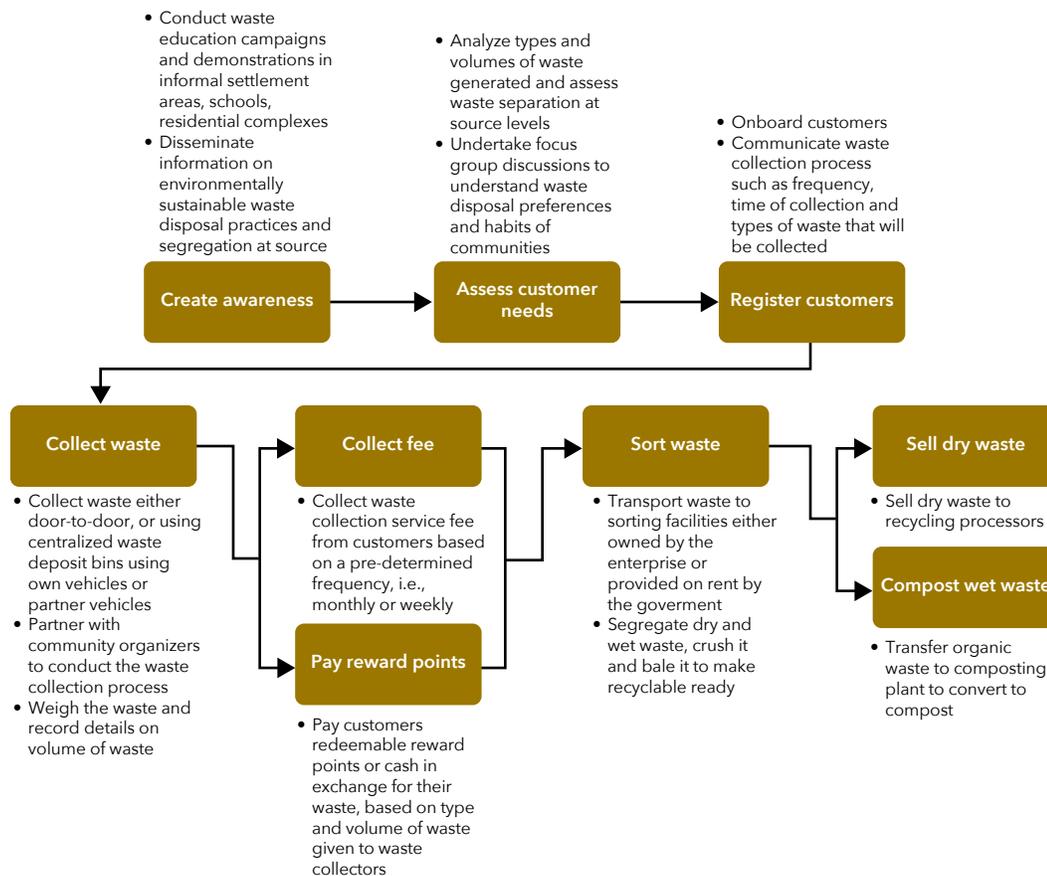
Figure 17. Waste collection services versus aggregated waste-pickers

What?	Access to waste collection services	Waste-picker aggregation
Components		
How?	<ul style="list-style-type: none"> Enterprises provide door-to-door or community-level collection services on a fee-based subscription model. Typically these enterprises complement collection systems run by municipal authorities providing services to unserved areas. 	<ul style="list-style-type: none"> Enterprises aggregate informal waste pickers, typically through a membership model and provide them training on hygienic waste collection and segregation practices, capacity building skills, and other support to improve their livelihoods. Some enterprises connect customers to waste pickers using ICT tools; enterprises identify unorganized waste pickers and provide them ICT tools that enable them in offering collection services thereby increasing their productivity and income
Key activities	<ul style="list-style-type: none"> Some enterprises adopt a rewards-based model where customers are offered redeemable points or cash in return for their waste. Such enterprises typically further sell the recyclable waste to recyclers/recycling mills. 	
Why?	<ul style="list-style-type: none"> Large portions of low-income population and slum dwellers ignored due to inability of centralized public waste collection systems to handle high volumes of solid waste generated 	<ul style="list-style-type: none"> Adoption of manual unhygienic waste collection methods and limited use of modern technology used in collection of solid waste Manual segregation of waste coupled with unsanitary waste handling measures leading to health risks for waste sorters Waste collection undertaken by dispersed individual waste collectors and manual scavengers who are often subject to social stigma
Development challenges	<ul style="list-style-type: none"> Inability of waste collection services to reach slums due to unplanned city infrastructure Lack of willingness to pay for waste collection services leading to improper disposal of waste by individuals/communities. 	

Provide access to waste collection

A number of enterprises provide door-to-door or community-level waste collection services. For instance, Uganda based Waste Master emerged in response to inadequate collection services in the country. The enterprise charges a nominal fee for collection from households in low-income areas. Many enterprises work with their local governments through public private partnership models to provide waste collection services. For example, Wecyclers, collects waste from households, sorts and segregates the waste, and sells it to Nigerian recyclers. Wecyclers works in partnership with the Lagos Waste Management Authority and collects waste using low-cost bicycles, thereby enabling reach into previously inaccessible areas.

Figure 18. Features of the waste collection model



Aggregate waste-pickers

Enterprises adopt this model to provide a safer, formal work environment for waste collectors, provide them capacity building services and provide their families better quality of life. Enterprises such as Hasiru Dala (the not-for-profit arm complementing the for-profit arm Hasiru Dala Innovations), a membership-based organization, aggregates informal waste-pickers and provide them with skills and training on efficient waste collection and sorting practices. Other enterprises such as Raddi Connect, Citizengage and Mindtree’s I Got Garbage connect dispersed waste collectors to waste generators using mobile and online platforms; therefore organizing the waste collection process and enabling waste-pickers to collect more waste and earn higher incomes.

Cost Factors

Waste collection services primarily incur collection, sorting and transfer costs (figure 3). Research by the UN on waste management activities in developing countries highlighted that collection and transporting of solid waste constitutes the largest demand on municipal

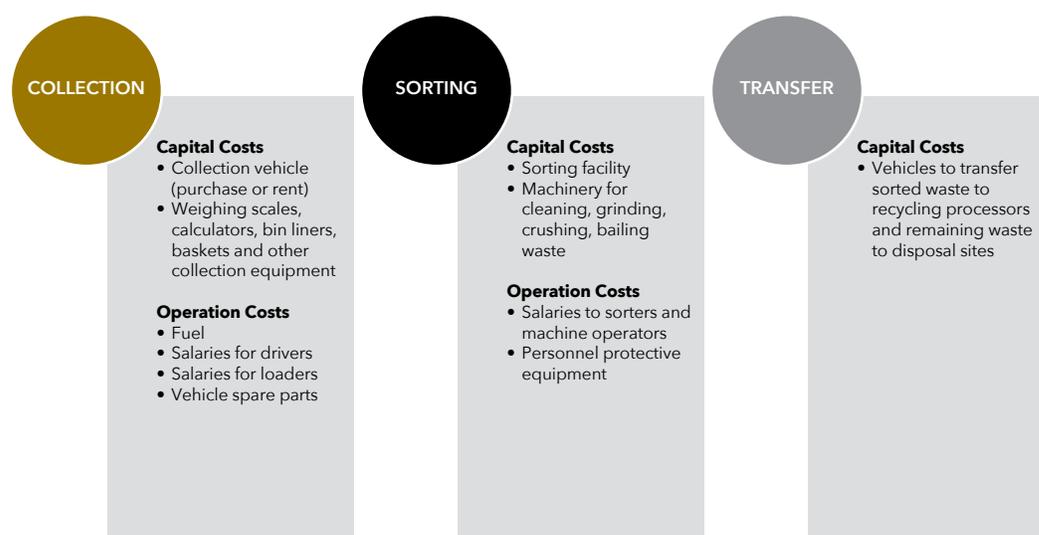
budgets (Manus and Coad 2010). Of the total expenditure incurred in solid waste management, typically 70 percent to 80 percent (Coffey and Coad 2010) is directed towards the collection and transporting of wastes.

Collection costs depend on factors such as types of waste collected, location of areas to be served, and density of waste, which in turn dictate the choice of collection vehicles and equipment, collection methods and size of labor crew employed in waste collection activities. Capital costs involved in collection activities include purchase of collection vehicles and collection equipment such as bin liners, weighing scales and calculators. Energy-efficient bicycles—‘Wecycles’ used in Wecyclers’ collection activities cost USD 700 per cycle in comparison to TakaTaka Solutions’ expenditure on waste collection trucks that cost USD 50,000-USD 70,000. Collection vehicles may be provided on lease or free of charge (based on a contractual agreement) by the government to enterprises. In other cases, enterprises may partner with recycling processors who provide their vehicles for waste collection.

Collection methods play a significant role in determining collection costs per household—for instance, community containers incurs the lowest cost of collection, followed by block collection, curb side collection and door to door collection (Coffey and Coad 2010). Bintang Sejahtera, ZoomLion and Ciudad Saludable employ a community-managed collection system whereas Waste Masters, Hasiru Dala Innovations, TakaTaka Solutions, BinBag and Wecyclers undertake door-to-door collection. Operational costs include salaries to drivers, loaders, financing of waste vehicle loans, fuel, and purchase of spare parts for vehicle maintenance. Enterprises such as Citizengage and I Got Garbage incur upfront costs on technology and software used in developing algorithms to optimize collection routes in order to aggregate sufficiently large volumes of waste and in connecting waste pickers to waste generators for scheduling waste collection.

Sorting activities can entail up to 50 percent of the total operating costs involved in waste collection (Perriou 2012). Costs incurred in the sorting process include upfront

Figure 19. Typical cost factors involved in waste collection services



capital expenses towards establishing sorting facility. In some cases, sorting facilities may be provided on rent or free of charge by municipal authorities. In addition, expenses on sorting, crushing and bailing machinery may also constitute upfront capital investment. Operational costs in sorting include salaries paid to staff who manually sorts waste and to machine operators, personnel protective equipment, electricity and other utilities to operate the sorting facility.

Waste collection providers who reward points in exchange for customers' waste incur upfront costs on purchasing these points from manufacturers and dealers whose products are redeemable by customers. Enterprises that compost organic waste incur expenses on the set up of a composting plant, procurement of composting machinery and equipment, and salaries paid to composting staff.

Revenue Streams

Waste collection models that involve enterprises providing fee based collection services earn a major share of their revenue from collection fees charged to waste generators. The fee may be charged as a flat fixed subscription fee that is paid by customers at the beginning of the month or the quarter, dependent on the frequency of waste pick-up. TakaTaka Solutions charges its different customer segments a fixed fee: USD 1 per month to low-income households residing in informal settlements, USD 2–3 and USD 5–6 to mid-sized and large-sized households respectively. Its commercial clients are charged a fee ranging between USD 100– 1000 depending on the volume of waste they generate and any services that they subscribe to in addition to waste collection and sorting, like requesting for monthly waste analytics reports. Some enterprises adopt a combination of fixed fee and variable fee based on volume and type of waste disposed by customers. For instance, Hasiru Dala Innovations prices its services on a polluter-pays model. It charges its customers (bulk waste generators in Bangalore) a fixed fee of INR 135 (USD 2) per month per household and variable fee based on the weight of dry waste and wet waste—higher the volume of separated waste the lower the variable fee charged.

Reward-based waste collection services that involve collecting customers' waste in exchange for redeemable gift points do not earn revenues from collecting waste, they rely instead on selling the waste for further processing by players down the value chain.

Another major source of revenue for enterprises providing waste collection services stems from selling collected waste materials to recycling and bio-gas processors. TakaTaka Solutions earns 15 to 20 percent of its revenues from selling sorted dry waste to recyclers. Wecyclers, Bintang Sejahtera and BinBag also sell sorted recyclable fractions to recycling processors. Citizengage and Hasiru Dala Innovations earn additional revenues by selling organic waste to bio-gas processors. Enterprises that involve community organizers in collection of waste pay these organizers a commission of the revenues earned on sale of recyclable waste to recycling processors.

Financial Viability

While most waste collection enterprises aspire to operate profitably, the lack of awareness about the benefits of environmentally sustainable waste disposal practices, and therefore, the reluctance to pay for formal waste collection services hampers the profitability of the model. Most enterprises do not have additional financial resources to spend on awareness and marketing activities—a key factor in increasing uptake of the model. Enterprises therefore typically rely on donor grants or operate as not-for-profit organizations. For instance, Peruvian community-managed waste enterprise, Ciudad Saludable was awarded a USD 615,000 grant from the Skoll Foundation which enabled it to increase scale in Peru and expand its operations to other countries of South America (Blake 2009).

Financial viability of waste collection service models are also derivative of the costs related to collection method, and vehicle use and maintenance. Depending on context, enterprises select and hence incur varying expenses on operating collection vehicles, maintaining the vehicles and wages to be paid to waste collectors (Coad 2011). In low-income developing countries costs associated with vehicle use and fuel are high, while labor is cheap (Coffey and Coad 2010). Research also shows that careful consideration should be given to region-specific waste type and volume, local waste handling practices and costs for vehicle maintenance such as lubricants and tires in selecting collection equipment (Schübeler, Wehrle, and Christen 1996). Prior to providing waste collection services, enterprises conduct in-depth assessments on the potential areas to be served to study the types of waste generated, existing waste disposal practices, volumes of waste generated, road access and infrastructure (specifically in unplanned low-income housing areas) and availability of labor before selecting the collection method and type of vehicle.

Taking into consideration that costs related to sorting activities comprise 50 percent of total collection costs (Perriou 2012), enterprises leverage on inexpensive labor to undertake manual segregation of waste versus investing in mechanized processes. Efficiency in sorting waste translates to higher revenues from sale of uncontaminated waste to recycling companies and bio-gas processors. TakaTaka Solutions employs 3 to 4 times more staff than typical waste collection companies in Nairobi to attain larger volumes of clean segregated waste that can be sold to recyclers. A number of enterprises educate customers on separation-at-source in order to minimize time and labor costs involved in sorting waste after it is collected. Hasiru Dala Innovations encourages behavior change in customers by charging them a variable fee commensurate to the level of segregation-at-source: higher the separation levels lower is the fee that they are charged. Prior to on-boarding low-income communities in its service coverage, Bintang Sejahtera assesses the level of segregation-at-source by the community and registers them as part of its service only once sufficiently high levels of segregation are reached. Wecyclers' model is designed to reward customers who are diligent in separating their waste.

Enterprises also adopt differential pricing strategies that allow them to cross-subsidize low-cost services designed for low-income populations with higher prices charged to affluent households and commercial clients, like in the case of TakaTaka Solutions.

A number of enterprises leverage strategic partnerships to lower their operational costs. For instance, under a franchisee model, Hasiru Dala Innovations partners with independent waste picker organizations, typically comprising a group of waste workers from low-income populations. Individual franchisee partners comprising two collectors, one driver, and two sorters operate independent wards and pay the enterprise a rental lease for waste collection vans under the agreement that the ownership of these vehicles completely transfers to the waste pickers in 4 years. This encourages the truck drivers and waste-pickers to maintain the vehicles in good condition and enables the enterprise to recover upfront costs incurred on purchase of collection trucks. Other forms of partnership may involve the use of partner recycling companies' vehicles for collection. BinBag partners with recycling companies who provide their trucks for dry waste collection; the recycling companies pay the enterprise for the recyclable waste collected net of logistics and transportation costs. This enables BinBag to remain cash-flow positive. Wecyclers partners with the Lagos Waste Management Authority (LAWMA) and uses the sorting facilities provided by the government body, at no cost, to undertake sorting and bailing activities prior to selling recyclable fractions to processors.

Revenues earned from sale of waste to processors depends on commodity prices, fuel prices, shipping costs, demand for recyclable products, and processing capacities of recyclers and bio-gas processing plants. Therefore, a large part of the model's sustainability is influenced by the recycling industry.

Partnerships

Waste collection models may entail various forms of partnership in collection, sorting and transporting activities. Enterprises partner with local community champions, municipal authorities, NGOs, and waste-picker co-operatives to create awareness about environmentally friendly and hygienic waste management practices. Enterprises work with these stakeholders in educating both, communities in order to convert them to customers, and informal waste workers, to engage them in the enterprises' formal collection services. For instance, Hasiru Dala Innovations engages waste-pickers who are aggregated by its sister company, Hasiru Dala (Hasiru Dala is an NGO that provides legal identity, formal recognition and dignified livelihood opportunities to informal waste workers in Bangalore, India). Waste workers associated with Hasiru Dala also work with other waste management enterprises.

Enterprises partner with waste processing buyers or the government for equipment and infrastructure. This helps minimize capital expenses for the enterprise. BinBag uses associated recycling companies' collection trucks to collect waste from households. Wecyclers uses sorting facilities owned by the local municipal authority—Lagos Waste Management Authority to undertake its waste sorting and bailing processes.

A number of collection models include cost-sharing and revenue-sharing between enterprises and its partners. Hasiru Dala Innovation incurs upfront costs on purchase of waste

collection vans which it transfers to partner franchisee waste worker organizations within 4 years of the partnership. As per contract, waste worker organizations undertake to oversee maintenance of the vehicles during the course of operations. Bintang Sejahtera operates its community-based waste banks by engaging area-specific community leaders as partners. Community organizers are incentivized by sharing revenues on sale of recyclable waste with the enterprise; they manage daily collection services in their locations, oversee segregation at source and educate customers on proper waste disposal practices.

Implementation: Delivering Value to the Poor

Awareness

Creating awareness is a pivotal requirement to initiate and increase uptake of waste collection services in developing countries. Wecyclers employs local unemployed youth in its collection activities. These youth also undertake awareness campaigns which involve visiting households in Nigeria's slums and imparting education on the benefits of using Wecyclers' reward-based service. TakaTaka Solutions also conducts door-to-door awareness campaigns on waste disposal practices such as educating customers on the type of bin liners to use for different types of waste. Hasiru Dala Innovations typically serves bulk waste generators; however, its education campaigns are designed for varied audience including housekeeping staff, low-income domestic help, children, and high-income residents. The enterprise's awareness initiatives include dumping garbage on a tarpaulin sheet outside the customer apartment complex and engage the residents in segregating wet waste, dry waste, and sanitary waste with the view to educate them on the challenges of unsegregated waste at source later in the waste stream. A number of enterprises leverage NGO support in conducting awareness campaigns, community sensitization and mobilization activities, focused towards changing customer behavior related to disposal methods and payment of collection services (UNEP and ISWA 2015).

Acceptance

Waste collection enterprises conduct extensive focus groups and surveys with target customers prior to registering them for the waste collection services. These interactions help enterprises in designing collection methods, frequencies, timings, type of vehicle and mode of payment (fee-based or reward-based). Conducting this exercise prior to implementing services enables customer stickiness and decreases chances of incurring costs in amending processes. For example, Citizengage learnt that most of its customers prefer to have their garbage collected at night and accordingly, it designed its services to incorporate collection at night.

Accessibility

Dismal waste collection services across developing countries owing to limited municipal budgets results in large sections of populations left unserved by collection providers. A number of enterprises like TakaTaka Solutions, Wecyclers and Waste Masters provide door-to-door collection services in hard-to-access and unplanned informal settlements. This level of accessibility translates to higher costs and narrower margins. Enterprises like Bintang Sejahtera and Ciudad Saludable provide community-managed waste collection services in low-income communities. Enterprises also provide access to formal employment opportunities to informal waste workers, like in the case of Hasiru Dala Innovations and Citizengage.

Affordability

Enterprises that adopt fee-based collection models charge customers minimal fees for the services. TakaTaka Solutions, for example charges customer USD 1 per month per household. Enterprises, like Wecyclers and Bintang Sejahtera that offer reward-based services enable low-income customers to earn incomes or redeemable points in exchange for their trash; customers can afford useful household appliances and food with these points. Enterprises that involve informal waste workers in their formal service delivery to customers enable these workers to purchase protective equipment for waste collection and sorting activities thereby fostering a safe working environment for them.

Results and Cost Effectiveness

Waste collection rates in low-income countries are a mere 41 percent (Hoornweg and Bhada-Tata 2012). Private sector participation in the waste collection process is instrumental in supporting the public sector to increase service coverage in developing countries. Private sector participation helps in easing strained municipal budgets on waste collection. Consistent efforts by private enterprises to improve service effectiveness and financial viability also translate into customers receiving quality waste collection services at lower prices (Kessides 2004).

Scale and Reach

Waste collection enterprises engage with low-income populations in developing nations in two ways: by providing waste collection services, and by providing income generating opportunities, predominantly for informal waste workers in these countries. A number of private sector enterprises have designed their service models to cater to larger populations and leverage the prevalence of informal waste workers to deliver services.

Ciudad Saludable, a waste collection enterprise based in Peru since 2002 has expanded to Bolivia, Brazil, Colombia, Mexico, Peru, Venezuela, and India. The enterprise has reached

Table 30. Scale and reach of select companies

<i>Company</i>	<i>Country of operation</i>	<i>Years of operation</i>	<i>Reach</i>
Bintang Sejahtera	Indonesia	4	• 5000 low-income customers
Ciudad Saludable	Bolivia, Brazil, Colombia, Mexico, Peru, Venezuela, and India	14	• 30 percent of Peru's population as customers • 1835 cities served in Peru • 1500 informal waste workers provided employment
Citizengage	India	1	• 2000 households (bulk-waste generators) and 100 commercial clients
Hasiru Dala (not-for-profit arm)	India	3	• 7000 informal waste workers provided membership
Hasiru Dala Innovations	India	1	• 20,000 households (bulk-waste generators) as customers. Low-income population involved in waste collection activities
TakaTaka Solutions	Kenya	5	• 12000 households (of which 9600 households are low-income) as customers • 105 waste workers from low-income background
Waste Masters	Uganda	5	• 500 low-income customers
Wecyclers	Nigeria	3	• 11,000 low-income households as customers

30 percent of Peru's population with waste collection services in 1,835 cities and has organized over 1500 informal waste collectors (Blake 2009). The enterprise has a community-based model and involves local communities to participate in waste collection and provides them self-employment opportunities. The potential to earn incomes ensures that waste collectors are motivated to provide reliable services, enabling the enterprise to scale and reach other unserved communities.

Indonesia-based Bintang Sejahtera has a similar community based model to provide waste collection services to 5000 people, including 50 households, and schools in Lombok Island (an island located in West Nusantara, Lombok is one of the most underdeveloped provinces in the country). The use of reward points in exchange for waste coupled with the involvement of local community organizers in managing operations enables the enterprise to reach a larger number of people.

Wecyclers in Nigeria has reached over 11,000 low-income households using its reward-based waste collection model since 2013. The use of tricycles—*Wecycles*—in its operations allows the enterprise to maneuver through narrow lanes in unplanned slum areas thereby increasing its reach to low-income customers. The enterprise has also employed 82 unemployed youth in its waste collection activities. Nairobi based TakaTaka Solutions has served over 12000 households; 80 percent of its customers are from low-income backgrounds paying USD 1 for the enterprise's reliable

waste collection services. The enterprise has employed 105 employees including unemployed youth and women from impoverished communities.*

Hasiru Dala, established in Bangalore India in 2013, provides low-income informal waste workers capacity building and technical training to improve their productivity in waste collection and recovery. It also provides them with government approved identity cards, health insurance and opportunities to connect with private waste management enterprises for employment. Its suite of services has enabled aggregation of over 7,000 informal waste pickers who are registered members of Hasiru Dala (Chakraborty 2014), which is a not-for-profit. Its for-profit arm established in 2015 leverages on this member base to provide waste collection services to over 20,000 households in Bangalore.†

Improving Outcomes

Waste collection enterprises have not only enabled extension of services to previously unserved low-income populations, but also reduced environmental degradation and ground-water contamination caused by improper waste disposal. Service expansion and engagement of informal waste workers has also fueled job growth and increased incomes in developing economies. Improved facilities and waste collection equipment used by private enterprises not only increase waste workers' revenues but also help in increasing their productivity (Schübeler, Wehrle, and Christen 1996). The use of technology in connecting waste pickers to waste generators in real-time has enabled optimization in scheduling pick-ups and thereby increasing productivity of these waste workers.

Waste collection remains the primary outcome in the business model. Bintang Sejahtera manages 28 tons of organic waste and 25 tons of inorganic waste per month reducing garbage in Lombok by up to 53 tons on a monthly basis (Harjani 2016). Wecyclers has diverted 525 tons of waste from reaching landfills in Nigeria. TakaTaka Solutions collects 470 tons of waste per month, enables recycling of 446 tons of waste per month and produces 50 tons of compost per month.

Enterprises have also provided informal waste workers with a formal and safer work environment along with increased revenue generating opportunities. Hasiru Dala Innovations has helped waste pickers double or triple their income—a waste picker partnering with the enterprise earns revenues in the range of USD 1.5–3 per day which translates to USD 135–150 per month.

Employees of Wecyclers, who were previously unemployed and comprise the at-risk group, have the ability to earn incomes in proportion to the waste that they collect—average income earned by waste collectors is USD 150 per month which is approximately USD 8 more than the minimum wage in Nigeria. Waste workers involved in Bintang Sejahtera's collection and sorting activities are typically low-income farmers who cultivate harvest twice a year and earn a gross income of approximately USD 1000 per season that is USD 2000 per year. As additional sources of income, these farmers earn USD 100–140 per month, which is USD 1200–1680 per year undertaking waste collection and sorting activities. In addition,

* Self-reported.

† Self-reported

the enterprise's waste banks allow communities to deposit their waste in exchange for immediate cash payments or cash deposited as savings (average accumulated savings: USD 19–23 per month) that customers typically withdraw on a quarterly frequency (Harjani 2016). Technology driven services provided by Citizengage enables optimized scheduling and helps waste collectors plan their waste collection routes and increase their efficiency in collecting waste. The enterprise has enabled its workers to increase incomes by two to three times. In addition to increasing incomes, enterprises have also improved working conditions and provided livelihood opportunities for their associated waste workers. Ciudad Saludable organizes groups of informal waste collectors—'recicladores'—to form community-level microenterprises. Under the informal sector, these workers earned approximately USD 2 per day selling small amounts of recovered waste to recycling centers. They also worked under unsafe conditions without appropriate protective gear, were victims of gang violence and prosecuted by the police. The enterprise provides them legal and technical support, and microcredit to purchase tools and equipment for collection activities, such as collection vehicles, gloves and helmets. Workers are also given the opportunity to consolidate recovered waste from individual collectors thereby increasing their bargaining power (Blake 2009).

Hasiru Dala's member waste workers are provided government-recognized identity cards that help improve the social status of these workers (Ray 2016). The enterprise has also helped over 1800 families in obtaining health insurance under the Rashtriya Swasthya Bima Yojana and has helped 4500 people in attending health camps. In partnership with Mindtree—an IT company, the enterprise has provided 100 education scholarships. Bintang Sejahtera donates 50 percent of its revenue to funding education requirements of the communities that it services.

Cost-Effectiveness

Private waste collection enterprises provide waste collection services either by charging low-income customers affordable prices or by rewarding customers in exchange for their waste. For unserved low-income populations, these enterprises help in combating ill-effects to public health and environmental degradation created due to improper disposal of waste within these communities.

It is estimated that collection costs make up more than 90 percent of total waste management costs in the lowest income countries that resort to open dumping after waste is collected (UNEP and ISWA 2015). It is also hypothesized that although costs of environmentally sustainable waste collection practices may seem high now, they will prove to be cheaper than to continue with unsuitable waste disposal practices like open dumping. Calculations reflect that incremental costs of proper waste management will be USD 5 to 7 per capita whereas likely cost of inaction and inadequate services may be USD 20-USD 50 per capita (UNEP and ISWA 2015).

Other statistics on the negative impact on public health and environmental pollution indicate that the present costs incurred in undertaking proper waste collection services out-

weigh the costs incurred if ineffective or non-existent waste collection services are provided. For instance, UN Demographic and Health surveys show that diarrhea and acute respiratory infections in children, in areas that burn or dump their waste in yards, are twice and six times as high in areas where waste is collected regularly (UNEP and ISWA 2015). And the UNEP Dioxin Toolkit suggests that in developing countries, of the total dioxin emissions, more than 60 percent is attributable to emissions associated from open burning of uncollected waste (UNEP and ISWA 2015).

Scaling Up

Challenges

Most enterprises cite challenges that relate to the government's role in waste collection—manifested either as an absence of policies or inadequate implementation of enabling policies. For example, enterprises in countries that don't mandate segregation-at-source end up incurring high costs in sorting and treatment activities. Enterprises also cite the same problem in the case of countries that do have policies on segregation-at-source but have not been able to actively enforce the mandate.

Given that waste receives scant attention in developing countries, enterprises face challenges in creating awareness about environmentally sustainable waste disposal methods. Enterprises particularly refer to difficulty in carving out adequate marketing and client awareness budgets from the limited revenues they earn by charging minimal waste collection fees to customers (customers will discontinue availing their services if charges are increased). However, customer awareness and education is critical to the profitability of the model. Failure to educate customers about the benefits of paying for formal waste collection practices, or the importance of segregating waste at-source or teaching them on the correct use of bin liners will all result in enterprises either not being able to on-board customers who are willing to pay or in increasing their operation costs.

A number of enterprises are also face with severe competition from other players in the market. For instance, TakaTaka Solutions, despite providing its services at USD 1 per month to low-income households faces stiff competition from illegal waste collectors who charge customers USD 0.50 per month and dispose collected waste into open dumping areas that are not legal landfill sites. Customers' lack of concern in understanding where their waste is discarded after collection drives them to avail cheaper services of illegal waste collectors.

Frequent absenteeism of waste workers makes it difficult for the enterprises to provide reliable collection services to their customers. Informal sector waste workers may be reluctant to work with private enterprises if they perceive a loss of their independence or suffer a loss of income (Coffey and Coad 2010) (despite an improvement in their working conditions and increased indirect benefits).

Enterprises also face challenges in developing efficient business plans that include pricing strategies, designing awareness strategies and linking practical application with business theory in the waste management sector, more specifically when catering to low-income customers. Capacity building programs to support enterprises in technical and business development

help scale the enterprise. For example, Uganda-based waste collection enterprise, Wisdom and Insight undertook the Living Earth's 'African Urban Enterprise Development Program' in 2012. After completion of the training, the enterprise expanded its customer base and increased its turnover by 300 percent and operates on a 75 percent payment rate in large part due to the quality of services and the proximity of the company to the community that it serves.

Role of Government and Policy

Waste collection models across developing countries assume different forms based on the role of national and regional governments in the waste management sector. Enterprise relationships with governments involve contracting, franchising, open competition or concession (Coffey and Coad 2010). Under contractual agreements, the municipality or regional authority selects a private sector service provider and defines the activities to be undertaken by the enterprise; the payment to the enterprise is made by the municipal authority. Governments also identify an enterprise as a franchisee and designate independent areas of collection that can be serviced only by the selected enterprise; in this case, the enterprises collect payments directly from customers. Open competition involves governments providing licenses to qualified enterprises who compete to provide services to areas of their preference. Governments also construct facilities and provide a concession to select enterprises to operate the facility and subsequently transfer complete ownership to the government.

Experiences between enterprises and governments reveal that governments in most developing countries lack competencies and resources to structure agreements and engage effectively through various forms of public-private partnership (UNEP and ISWA 2015). Public-private partnership models in waste collection could involve enterprises using government owned collection vehicles or government owned sorting facilities. Research indicates that success of a relationship with private sector players depends largely on the local government partner more than the private sector enterprise (Coffey and Coad 2010). Governments should therefore engage in developing staff capabilities and understanding on waste collection processes, expectations from enterprises and policy monitoring responsibilities. Special purpose agencies like the Infrastructure Investment Facilitation Company in Bangladesh, established to increase government staff competencies in handling public private partnership models in waste management, serve as an example for other developing country governments to follow (UNEP and ISWA 2015).

Legislation and, more importantly, the enforcement of legislation, are critical in shaping an effective waste collection system (Coffey and Coad 2010) in developing countries. Implementation and monitoring of policies ultimately influence customers' willingness to pay and their diligence in following proper waste disposal practices. For example, Local Ordinance No. 2031 passed in Cebu City, Philippines mandated segregation-at-source and established violation penalty charges. However, it was the effective enforcement of the law that resulted in a decrease in violations (UNEP and ISWA 2015). This is in stark contrast to the situation in Bangalore, India where lax enforcement of the segregation-at-source law passed in 2003 does not restrict citizens from continuing to dispose mixed waste since they are not subject to any penalties.

Policies mandating extended producer responsibility (EPR) will increase partnership opportunities for collection enterprises to engage with large corporates—a source of significant revenue for enterprises in the waste collection space. Zero-waste management policies will also increase enterprise engagement with institutions like hotels and resorts that would like to demonstrate environmentally friendly practices in running their businesses.

Governments in developing countries need to address the significant gap in collecting reliable and timely data on waste collection particularly since costs incurred on waste collection represent the largest share of total waste management costs[‡]. Research institutes

Table 31. Social enterprises: Waste collection services

<i>Company</i>	<i>Country</i>	<i>Description</i>
Bintang Sejahtera	Indonesia	Bintang Sejahtera is a community-managed waste collection enterprise that operates in Lombok Island in Indonesia. The enterprise identifies community organizers who manage waste banks, where community citizens deposit recyclable waste. Based on the weight of waste deposited, customers are rewarded cash. The enterprise sorts the waste and then sells it to a recycling company in East Java.
Ciudad Saludable	Bolivia, Brazil, Colombia, Mexico, Peru, Venezuela, and India	A community-managed waste enterprise established initially in Peru. Informal waste workers are organized into groups to form a microenterprise that then manages waste collection of their communities. Waste collectors sell collected waste to recycling companies.
Citizengage	India	A technology driven waste collection enterprise that provides collection services to bulk waste generators in Bangalore, India. The enterprise employs waste workers from low-income populations and enables them with technology to track collection schedules. The enterprise sells wet waste to bio-gas processors in the city.
Hasiru Dala Innovations	India	A fee-based waste collection provider servicing bulk waste generators in Bangalore, India. The enterprise charges customers based on the volume of segregated waste at source. The enterprise partners with informal waste workers to deliver its waste collection services.
TakaTaka Solutions	Kenya	A fee-based door-to-door waste collection service provider, with specific focus on low-income customers. The enterprise cross-subsidizes its services by charging higher prices to affluent households and commercial clients. It collects waste, sorts it, sells recyclable fractions to recycling companies and converts wet waste to organic compost.
Waste Masters	Uganda	A fee-based waste collection enterprise that specializes in household and institutional door-to-door garbage collection in rural and peri-urban areas.
Wecyclers	Nigeria	A rewards-based door-to-door collection enterprise. It uses low-cost energy efficient tricycles 'Wecycles' in its waste collection from densely located informal settlement areas in Lagos.

[‡] Of the total expenditure incurred in solid waste management, typically 70 to 80 percent is directed towards the collection and transporting of wastes and 90 percent in lowest income countries where open dumping is practiced predominantly

that support governments in framing policies typically focus on recycling and disposal rather than collection (Coffey and Coad 2010). Area-specific data (Schübeler, Wehrle, and Christen 1996) on waste composition, density, volumes, and waste handling efficiencies (Coffey and Coad 2010) will help governments and enterprises in selecting appropriate types of collection vehicles. Sufficient data will also help in planning collection routes and categorizing zones while contracting enterprises under zone-based collection systems; for example, Government of Uganda's Kampala Capital City Authority, divided the city into seven zones ensuring an equitable distribution of informal settlements in each area with high-income neighborhoods in order to help private service provider to cross-subsidize their operations (UNEP and ISWA 2015). Governments can also use this data to estimate waste processing capacities and build sufficient recycling and bio-gas plants, which will absorb recovered waste while providing collection services—a key revenue stream for most waste collection enterprises.

Conclusion

Given the low collection rates across developing countries, it is apparent that waste collection enterprises have a significant opportunity to plug in the gaps in servicing low-income populations. Taking into consideration the dual impact of waste collection services, in improving the environment and public health, and in providing a dignified source of employment for informal waste workers, enterprises serve a need that cuts across different income segments. They have therefore been able to garner sufficient recognition in recent years and reach a large number of customers within a few years of their operation.

However, the model's profitability will hinge on the role that the government plays in engaging with these enterprises. The support that governments provide in terms of bearing upfront capital costs incurred on waste collection vehicles and equipment for sorting will determine cost structures of enterprises. Policy mandates related to proper disposal methods and segregation-at-source, coupled with strict enforcement by regulatory authorities involving penalties for violation will also have a marked impact on shaping customers' willingness to pay and waste disposal preferences, thereby influencing viability of the collection model.

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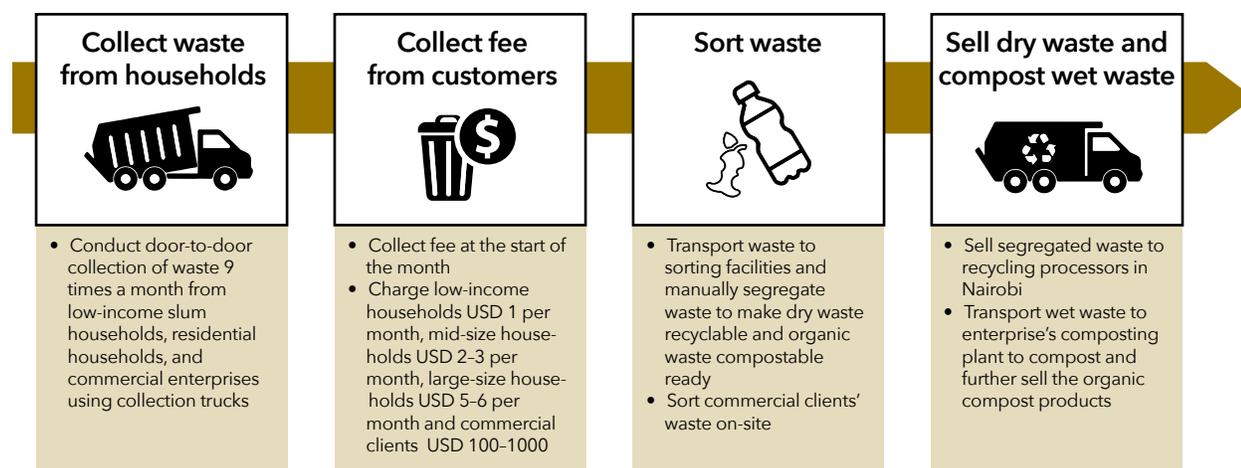
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	<p>PROFILE</p> <h2>TakaTaka Solutions</h2>
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<p>Founding year: 2011 HQ: Nairobi, Kenya Countries of operation: Kenya</p>	<p>Orientation: For-profit Employees: 105 Turnover: USD 350,000</p>
<p>Nairobi and surrounding counties generate approximately 3,500 tons of waste on a daily basis, of which 70 percent is organic waste that, if left uncollected, contaminates dry waste making it unrecyclable. Only 30 to 50 percent of the waste is collected by legal waste management companies, while the remaining waste is either left uncollected or collected by informal waste workers who dump it illegally. The city's waste collection setup is based on free competition and is not restricted to ward-wise collection. As a result, a number of waste collection agencies opt to serve areas that are easily accessible and financially viable. These companies do not dispose of waste in an environmentally conscious manner, thereby accentuating the problem of mismanaged waste.</p> <p>TakaTaka Solutions provides affordable waste collection services to unserved low-income households in Nairobi. It undertakes door-to-door collection of waste, sorts it, sells dry waste to recyclers, and composts organic waste in its composting plant. Its operations divert 95 percent of the waste from reaching landfills. The enterprise has served 12,000 households, of which 80 percent are low-income.</p>	

Operating Model

TakaTaka Solutions is a Nairobi-based waste collection enterprise. It offers affordable door-to-door collection services to low-income households and informal settlements that were previously unserved—2.5 million people (two-thirds of Nairobi's population) cannot afford waste management services. The enterprise also collects waste from mid-sized and large-sized households and commercial businesses. Lack of environmentally



sustainable waste disposal options leads to a majority of the city's population either burning their waste or dumping it in unauthorized places. For waste that is collected, waste collectors in the city typically undertake one collection trip per day and spend 4-6 hours in long queues awaiting their turn to unload their trucks at the Dandora dump yard—Nairobi's official landfill. With over 200 trucks entering the dumpsite and disposing over 800 tons of waste on a daily basis, the landfill overflows into neighboring slums of Korogocho, creating severe health and environmental problems.

Mismanaged landfills, coupled with lack of sufficient formal collection services, and a dearth of uncontaminated recyclable waste were primary factors that led to TakaTaka Solutions' inception in 2011.

TakaTaka Solutions employs local unemployed youth to collect waste and trains clients on effective ways to manage their waste using bin liners. Collected waste is transported to the enterprise's sorting facilities and manually segregated by staff, primarily women employees, into 40 fractions. The enterprise converts wet waste to organic compost in its composting plant and sells the various dry waste fractions to recyclers in Nairobi. In this manner 95 percent of the waste collected is recycled. This represents one of the highest recycling rates in the world (for example, the United States has a recycling rate of 34.5 percent).

The enterprise markets its services directly to landlords of low-income informal settlements. It conducts door-to-door sales and proposes its services to landlords. Its marketing budget is minimal given the limited fee charged to customers. TakaTaka's experience of serving low-income customers indicates that they are willing to pay for waste management services. However, lack of awareness about best practices in waste disposal combined with weak policy enforcement related to waste disposal standards drives these customers to either illegally dispose their waste or subscribe to informal waste collection services that are marginally cheaper than TakaTaka Solution's service.

Financial Sustainability

The enterprise adopts a differential pricing strategy across customer segments to cross-subsidize the low prices it charges to low-income households. Its pricing strategy leverages

on the fact that while low-income households are concerned about reliable collection, high-income commercial clients are interested in environmental impact. Accordingly, the company provides affordable collection services to low-income households and charges commercial clients higher prices by bundling value added services along with waste collection services, such as publishing CO₂ emission reports to help these clients track their carbon footprint. The enterprise conducts waste collection 9 times a month and charges low-income customers a fee of USD 1 per month per household. Mid-sized and large-sized households are charged USD 2-3 and USD 5-6 per month respectively. Commercial clients are charged a fee ranging between USD 100–1000 depending on the volume of waste they generate. Taka Taka also offers other services that commercial customers can subscribe to in addition to waste collection and sorting, such as requesting for monthly waste analytics reports providing details on their contribution towards carbon emission reduction.

TakaTaka's primary competitors in low-income areas are informal waste collectors who offer collection services at USD 0.50 but dispose the waste illegally and not in designated landfills, creating further environmental issues.

TakaTaka incurs significant costs in salaries paid to staff involved in sorting activities. By employing sorters and composting staff, the enterprise typically employs 3 to 4 times more staff than other waste collection companies in Nairobi. This enables it to derive higher volumes of segregated and clean waste, which commands higher revenues from sale of recyclable waste to recyclers.

Labor costs incurred in collection, sorting and composting activities; purchase of bin liners; and fuel to operate waste collection trucks also constitute major costs. The enterprise owns 2 sorting facilities: the capital cost in maintaining the facility is USD 40,000 per facility of 20 tons daily input, operational cost incurred is USD 10,000 per month. It incurs capital costs of USD 350,000 to maintain 1 composting plant of 25 tons of input per day. In addition, the enterprise purchases premium quality waste collection trucks that are priced between USD 50000–70000 per truck.

The primary sources of revenue include collection fees, sale of dry waste to recycling processors and sale of organic compost to small-scale farmers to help them improve soil productivity.

Impact

The enterprise collects waste from 12,000 households in Nairobi and surrounding counties, diverting 95 percent of the waste collected from residential clients and 100 percent of that collected from commercial clients from reaching landfills. It collects 470 tons of waste per month, enables recycling of 446 tons of waste per month and produces 50 tons of compost per month. TakaTaka has provided employment opportunities to 105 employees including youth and women in its waste collection, sorting and composting activities. It has saved 1,100 carbon dioxide (CO₂) emissions per year based on composting calculations alone.

Challenges and Lessons

Waste management is perceived to be a public good and one where the benefits are not visible to customers. Low-income customers value reliable collection services but are not concerned about where their waste is disposed after it is collected. TakaTaka's model, despite being an affordable formal waste collection service, is more expensive than services provided by informal waste collection providers who dump the waste illegally; low-income households subscribe to these services instead.

	<p>PROFILE</p> <h2>Wecyclers</h2>
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Founding year: 2012	Orientation: For-profit
HQ: Lagos, Nigeria	Employees: 47
Countries of operation: Nigeria	Turnover: USD 200,000

Nigeria faces a waste crisis that will only worsen as the city's population grows. People living in slums and informal settlements lack access to formal waste collection and are subject to unsanitary living conditions and prone to diseases. The overburdened municipal government of Lagos collects only 10 percent of the city's garbage and a mere 13 percent of recyclable materials are salvaged from landfills. On the other hand, recycling firms in Lagos face a supply constraint, operating at sub-standard capacities since they cannot access an adequate supply of quality materials required for processing.

Wecyclers, in partnership with the Lagos Waste Management Authority (LAWMA), collects dry waste, sorts the waste, and sells it to recyclers. The company provides door-to-door waste collection using energy-efficient bicycles—'wecycles.' It employs local unemployed youth in undertaking collection and sorting activities. Wecyclers rewards households with redeemable points, communicated via SMS, depending on the volume and quality of waste selected. It has served over 11,000 households and has collected 515 tons of waste.

Operating Model

Wecyclers is a dry waste collection company based in Nigeria. The urban waste management company uses an SMS-based incentive mechanism to encourage low-income households in densely populated settlements to dispose their reusable waste in an environmentally sustainable manner. Its model is geared towards solving the severe lacunae in Lagos' waste disposal infrastructure and debilitating recycling culture—a meagre 40 percent of waste



in Lagos is collected by local authorities and a mere 13 percent of recyclable material is recovered for further processing.

The enterprise identifies unemployed youth in low-income communities and hires them to be part of Wecyclers’ collection and sorting activities. The youth are also engaged in spreading awareness about its services amongst low-income communities—they impart education about the ill-effects of improper waste disposal and provide knowledge on the benefits of using Wecyclers’ reward based waste collection service.

Households register for the service and the team provides door-to-door waste collection services on a weekly basis. The company collects waste using low-cost bicycle-powered collection vehicles called “wecycles.” These vehicles are cost-effective, easy to operate and simple to maneuver through Lagos’ traffic ridden roads and narrow lanes in informal settlements - Wecyclers’ core areas of operation. Customers are not charged a fee for collection of waste, but instead are provided reward points that can be redeemed for household goods and electronic appliances. The process involves a web based point management system where in waste collectors weigh and assess the dry waste and input the data into the system, the points calculated thereafter are communicated to individual households through mobile text message updates.

The collected waste is transported to sorting hubs where it is sorted manually, typically by women employed by the company. Sorting and segregating the dry waste includes activities such as removal of labels, bottle caps and aluminum can contents to convert mixed waste into segregated fractions of recyclable material. The sorted waste is then sold to local recycling processors at prevailing market prices.

As a partner, the local government agency, Lagos Waste Management Authority (LAWMA), provides waste aggregation and sorting facilities and support in identifying potential areas of operation along with creating awareness about its model amongst low-income communities. The company also partners with corporate institutions such as DHL Nigeria and Unilever Nigeria in reaching more customers and promoting its model.

Financial Sustainability

The company's financial viability hinges on the consistency in sourcing quality material that it can continuously supply to processors. The team collects and sorts 500 kilograms—1 ton of waste on a daily basis. Households are provided redeemable points in exchange for their recyclable waste, based on the weight of the waste. For example, 1 kilogram of plastic would equal 10 points translating to 10 Naira, 1 kilogram of aluminum cans could fetch a household 20 points. Wecyclers sells the waste to recycling processors and earns revenues; 1 kilogram of plastic would be sold at 15 Naira. The company typically earns an 80 percent margin excluding the cost of collections, overheads and cost of waste sorting. At the start of its operations, Wecyclers purchased 25 collection cycles for USD 700 per cycle and procured software to manage text feeds.* The company is not yet profitable and is currently supported by donors through grant funding.

Impact

Wecyclers creates significant social, economic and environmental impact. It employs local unemployed youth allowing these youth to earn incomes that slightly exceed the minimum wage in the country—employees are paid an average salary of USD 150 per month, approximately USD 8 more than the minimum wage. The enterprise has created 50 jobs in Lagos, and has collected 525 tons of waste and prevented it from reaching landfills. Wecyclers use of energy-efficient bicycle collection vehicles enables easy access to underserved neighborhoods with minimal environmental impact.

Wecyclers' reward based model provides a source of improved livelihood for many low-income families in Lagos—a family on average receives USD 10 per month, roughly 20 percent of their total income, which they can use to buy household necessities. In addition, it helps its partner families to open bank accounts that they can use to receive Wecycler points or use for other transactions.† Wecyclers has received several awards including the Sustainia Award in 2014, Tech Awards in 2013, and SEIF Award for Social Entrepreneurship in 2015.

Challenges and Lessons

The lack of awareness about responsible waste disposal practices and the benefits of recycling make it a significant challenge for Wecyclers to increase their customer base. However, the partnership with LAWMA helps in reaching more low-income households and creating awareness. The incentive based waste collection model requires significant financial support, which is in limited supply.

* <http://www.smallispowerful.fr/wecyclers-nigeria/>

† <http://www.smallispowerful.fr/wecyclers-nigeria/>



Converting Waste to Energy

Innovation solutions are generating energy from landfill-bound waste, providing environmental benefits

HIGHLIGHTS

- Waste-to-energy enterprises reduce CO2 emissions, save trees, save time spent on collecting firewood, provide smoke-free energy, and deliver cash savings from replacement of expensive fuel.
- On-site waste-to-energy enterprises empower households to recycle the waste they generate into energy (mainly biogas) for their own consumption or sale to their community.
- Off-site waste-to-energy enterprises are highly scalable and provide products (briquettes, liquid fuel) that are more cost-effective than traditional energy products (wood charcoal, diesel).



Summary

Inefficient disposal of waste in large quantities chokes landfills and water bodies, ultimately resulting in health and environmental issues. Low- and middle-income countries lack adequate infrastructure and technology required for efficient solid waste treatment. Mixed waste is particularly difficult to treat due to heterogeneity and lack of suitable technology. All waste, therefore, ends up, in landfills and open dumps, and poses risks of garbage fire and choking water channels. Alternatively, it is incinerated, which often causes air pollution and deteriorates the environment. Untreated waste causes huge environmental impact on wildlife, ecosystems and to human health.

Much of this waste, however, retains value, and can be recycled and reused. Significant amount of waste can produce energy that replaces expensive fuels. In recent years, research

and development efforts have resulted in many waste treatment solutions that generate energy from landfill-bound waste. Waste-to-Energy enterprises bring innovative technologies aimed at addressing waste while ensuring better sustenance of the environment and minimum damage to the ecosystems. The two major types of waste-to-energy technologies are on-site (decentralized energy generation near the source of waste) and off-site (centralized waste generation away from the source of waste). These technologies produce energy products such as briquette and biogas for heating and cooking purposes and electricity generation. A few enterprises have also invented technology to convert plastic waste into petroleum-based fuel.

Development Challenge

Globally, millions of tons of waste is generated, of which 60 percent (Clean India Ventures 2017) is organic and can be reprocessed. Low-income communities are often unable to afford structured waste management processes to dispose their trash. Most of the waste ends up in open dumpsites near residential areas, causing diseases, polluting the environment and occupying extensive space. While recycling and reusing are disposal options, they are not always feasible for all types of waste. Recyclable waste can also become so contaminated that they cannot be economically or practically recovered. Moreover, since waste is not segregated at source, it is difficult and unviable to recycle mixed waste. Hence, the waste is typically dumped into landfills without being treated, posing higher risks of environmental damage.

Incineration is another commonly employed means of managing waste. Estimates of global black carbon emissions suggest that 40 percent comes from open burning of biomass, including forest and grassland fires and open burning of both urban and agricultural waste, while 60 percent comes from energy sources, including power plants, industry, transport and residential fuel use (UNEP and ISWA 2015). Lack of effective methods in disposal of non-biodegradable plastics leads to soil degradation and impacts groundwater tables. Since plastics are manufactured from crude oil derivatives, dumping used plastic in landfills represents a huge waste of energy that, if recovered, could diminish the pace at which fossil fuels are being depleted globally.

With growing populations, there is increasing pressure on the Earth's resources for energy. Waste-to-energy solutions to convert different types of organic waste into clean-burning fuel helps save forests and cuts greenhouse gas emissions by replacing wood, charcoal and fossil fuels for cooking and industrial processes. Besides being cleaner and easier to manage, biomass briquettes are also less polluting and have a higher calorific value than the traditionally used wood and charcoal. Wet organic matter like animal dung, kitchen leftovers and human waste can be used to produce biogas, a mixture of methane and carbon dioxide, as well as a semi-solid residue for compost. For families in the developing world, using biogas can replace the less efficient wood that emits health-damaging smoke. Biogas and briquette usage also reduces deforestation and greenhouse gas emissions, thus helping in climate change efforts.

Business Model

In recent years, social enterprises have commercialized waste-to-energy technologies to convert the unrecyclable waste to affordable fuel products, either at the source of waste generation (on-site) or at a centralized facility (off-site).

Components of the Model

Many social enterprises provide innovative solutions that enable households or businesses to convert the waste they generate into useful energy. These enterprises treat waste at source to bring down transportation inefficiencies and consume low-cost energy for domestic/ industrial purposes. For example, The Waste Transformer, an enterprise that operates in Sub-Saharan Africa, offers gasifier waste-to-electricity installations that can handle a wide variety of waste streams as its input, including wood, food, plastics and agricultural waste. These wastes are then turned into heat and gas. The resultant gas can then be used to generate electricity.

Some enterprises deploy large scale solutions where waste is procured, transported to processing facilities and centrally processed into liquid fuel or briquettes. These enterprises employ waste collectors to aggregate waste and transport it to their plants thereby providing livelihood opportunities to local people and reducing the flow of waste to landfill dumps. For example, India-based Rural Renewable Urja Solutions makes biomass briquettes using forest residues or agro-waste which include dry leaves, grass, weeds, forest residue, cow dung, sawdust from local sawmills, and highly inflammable pine needles. These briquettes are then supplied to brick kilns, manufacturers, boiler operators for steam generation, and food processing industries that use coal for heating purposes. Similarly, SGFE (Sustainable

Figure 20. On-site conversion of waste to energy



Figure 21. Off-site conversion of waste to energy



Figure 22. Description of on-site and off-site conversion of waste to energy

Why?	<ul style="list-style-type: none"> Farmers/households lack access to small scale on-site technology to convert waste to energy, thereby pushing them to incinerate their agricultural and household waste 	<ul style="list-style-type: none"> Absence of large-scale energy plants and lack of modern technology that converts waste to energy Majority of the waste generated is mixed waste; governments lack resources and technology to treat mixed waste. Hence, the waste ends up in landfills, which is difficult to manage and poses public health and environmental risks.
Development challenges	<ul style="list-style-type: none"> Farmers/households lack awareness or access to affordable sources of energy, pushing them to use expensive conventional sources of energy 	
What?	On-site conversion of waste to energy	Off-site conversion of waste to energy
Components		
How?	<ul style="list-style-type: none"> Many enterprises manufacture and sell equipment for conversion of waste to energy at the household level The technology is generally sold to household waste generators as a do-it-yourself kit; enterprises impart training about the systems to enable individuals to produce energy for domestic consumption Some enterprises also provide innovative financing/marketing options to enable ease of access to these technologies 	<ul style="list-style-type: none"> Some enterprises aggregate plastic and organic waste into a central facility and, using their proprietary technology, convert the waste into fuel such as diesel, briquette, and pellets The fuel is sold to industries—as a replacement for coal and diesel—for purposes such as heating, steam generation, operating machinery, etc. Some enterprises have designed technology that can treat and convert mixed waste to energy
Key activities		

Green Fuel Enterprise), an enterprise in Cambodia, manufactures charcoal briquettes using coconut waste and wood char waste.

Cost Factors

On-site waste-to-energy enterprises incur high costs on developing and manufacturing the waste treatment systems while off-site waste-to-energy enterprises incur high costs for setting up the waste treatment plants (SimGas 2017; Clean India Venture 2017; SGFE 2017; and Biotech India 2017). Off-site enterprises incur higher capital expenditure overall.

On-site waste-to-energy systems treat waste locally, and hence, do not incur costs associated with waste collection. For example, consumers of SimGas and (B)energy collect their own organic waste (e.g. animal dung, kitchen waste, human faeces, and agricultural residues) and feed them into the mobile biogas systems provided by the enterprises. Some enterprises provide community level solutions, which treat waste and generate biogas for a few households. The capital cost of setting up a community biomass gasification plant is USD 1,500 per kW for plants up to 1000 kW, and USD 1,200 per kW for plants of 100–1000 kW. Running costs are estimated at about USD 0.05 per kWh.

Off-site waste-to-energy enterprises, on the other hand, have to collect waste for conversion into fuel products such as briquettes and biogas. They also incur significant capital expenditure in setting up the centralized facility to convert waste into fuel. A typical off-site biogas plant costs around USD 50,000. However, with growing commercial interest in biomass gasification, these costs are declining with a reduction in input costs. High-pressure briquetting plants are expensive because the equipment needs to withstand the pressure involved in the conversion process. For example, a typical piston press from India

with a 65 kW motor costs about USD 17,000, and the whole plant (including driers, grinders and handling equipment as well as the press) costs about USD 50,000 (Ashden, Briquettes, n.d.). Such a plant produces about 700 kg/hour of briquettes, or about 1,500 tons per year. In India, production costs are about USD 60 per ton, although this varies depending on the cost of the agricultural residues (Ashden, Briquettes, n.d.).

Revenue Streams

The major revenue streams for waste-to-energy enterprises include sale of waste treatment systems and energy products such as biogas and briquette.

Briquettes are sold by off-site waste-to-energy enterprises at prices that are generally comparable to wood charcoal of the same calorific value. Typically, briquettes and pellets are retailed at USD 80 and USD 300 per ton, respectively (Ashden, Briquettes, n.d.). The prices of these household plants vary from country to country, but they are typically priced around USD 500 (Ashden, Biogas, n.d.). Samuchit Enviro Tech in India retails a 0.3 m³ digester for USD 320 and a 1 m³ digester for around USD 400.

Some enterprises such as Ventana CleanTech have a hybrid model wherein it has both on-site and off-site systems. Ventana CleanTech earns revenues by designing, manufacturing, and selling waste-to-energy systems to industrial waste-plastic recyclers and other waste management companies that aggregate waste plastics from municipal, industrial and commercial sources. It also plans to sell high-grade fuel from its self-owned plants to industries that consume petrol or diesel for its operations.

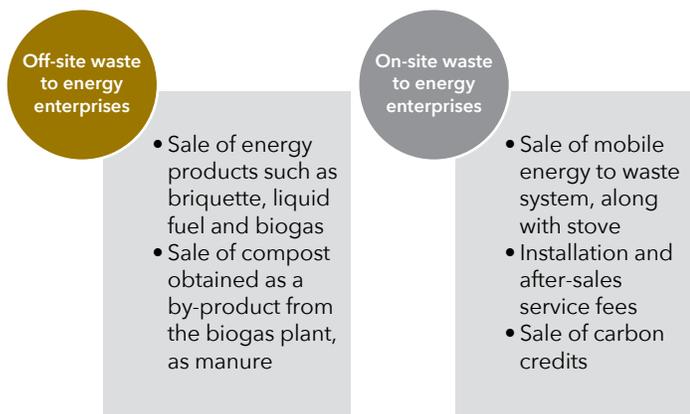
A few enterprises have adopted an asset-light franchise model wherein they outsource both, manufacturing and sales of the systems, and earn a commission for training, marketing and consultancy. For example, (B)energy obtains the biogas systems from a manufacturer and has appointed rural entrepreneurs as franchises to market and sell the systems. It takes a small commission of around 10 percent on each system ((B)energy 2017).

Financial Viability

On-site biogas enterprises such as SimGas earn revenues from sale of the biogas system (includes cook-stoves and other components). SimGas sells the entire kit for an average price of USD 750. It has also tied up with the World Bank's carbon credit program, where it is paid fees based on the carbon credits earned by its customers. SimGas uses these funds to cross-subsidize product prices for its customers.

Profitability in briquettes depends upon the cost and availability of raw materials and the market price (often based on prices of competing fuels). This makes the viability of briquetting as a business very site specific ((B)energy, 2017). Per ton, charcoal is more expensive than wood because of its higher energy content and the same applies to char-briquettes. SFGE's cheapest char-briquettes retail for about the same price as wood-charcoal in Cambodia, about USD 0.35 per kg (USD 350 per ton). However, many restaurants are prepared to pay twice as much for their highest-quality briquettes, because these burn more slowly and evenly.

Figure 23. Sales for waste-to-energy enterprises



Partnerships

Many off-site waste-to-energy enterprises piggyback on government waste management programs to install centralized small-scale waste-to-energy systems. For example, Clean India Ventures (CIVL), an enterprise in India that manufactures waste re-processors, has joined the Swachh Bharat Mission (Clean India Mission) to install community-based waste re-processor machines. Each waste re-processor upcycles 0.5–3 tons of organic waste like garden waste, temple waste, kitchen waste and vegetable waste into high-quality organic compost to be used as fertilizer or biofuel for cooking. CIVL has also partnered with New Delhi Municipal Council, a local Government body in India, to install plants in localities, parks and gardens. Each of the plants costs USD 0.2 million (Hindustan Times 2014). Waste (of which 90 percent is organic waste and 10 percent is non-biodegradable plastic waste) is collected from neighboring households. This is expected to divert at least 60 percent of the 4000 tons of waste generated in Delhi per day from landfills. CIVL also employs young rag-pickers from nearby areas for garbage collection and running of the plants.

Waste-to-energy enterprises also partner with local manufacturers, R&D experts and NGOs throughout the development and implementation of their products. For example, digesters are developed and designed by SimGas BV in the Netherlands in close collaboration with Silafrica and other local partners. SimGas has also entered into strategic partnerships with multilaterals such as Hivos, Global Alliance for Clean Cookstoves, Africa Biogas Partnership Program, SNV and others. Husk Power Systems, an enterprise based in India, has established strategic partnership with Shell Foundation and IFC for capacity building, establishing health and safety procedures and training infrastructure.

Implementation: Delivering Value to the Poor

Awareness

Most waste-to-energy enterprises use non-traditional marketing channels to create awareness about their products and services. For example, SimGas promotes its products through local churches and NGOs that are well connected with the local community. Habona promotes its product through social media (Facebook), while Biotech organizes roadshows around southern India, demonstrating the benefits of biogas plants to a wide audience. The enterprises share that they are able to convince many people to install biogas plants as a result of the publicity, as well as because of the rising cost of alternative fuel such as Liquefied Petroleum Gas (LPG). Clean India Ventures advertises its products through outdoor exhibitions and through the championship of Government officials. SGFE advertises its product on tuk-tuks (three-wheeler public transport) to target low-income consumers.

Some enterprises also provide awareness and capacity building services to customers who purchase their solutions. For example, Sistema Biobolsa (Biobolsa) is a social enterprise that produces bio-digesters for smallholder farmers in Mexico and Latin America. It not only offers to build and install the machinery required to carry out waste conversion but also helps and teaches farmers about the system. Biotech India has a well-equipped training center to provide training to 75–100 people at a time. Similarly, Sky Link, a social enterprise that builds and installs biogas plants in Kenya, trains local technicians so that they have the skills to build biogas plants.

Acceptance

Waste-to-energy enterprises create win-win situations for their customers (access to clean energy) and entrepreneurs/franchise partners (additional source of income). (B)energy, a waste management enterprise based in Ethiopia, provides households in rural Africa, Asia, and Latin America with access to cooking biogas by converting organic solid and liquid waste to biogas and fertilizer. It supplies a semi-mobile biogas production unit that is quick and easy to install in homes and is affordable. (B)energy customers (entrepreneurs and franchises) can produce up to 1.5 m³ of biogas from 20 kg cow dung daily, and further sell the biogas to consumers (neighbors and community members) in a ‘biogas backpack’ at the rate of USD 4 for 100 liters. The mobile backpack makes it easy and affordable to transport the gas, which can be used as clean cooking fuel.

Some enterprises use local champions as employees to drive acceptance of their waste-to-energy solutions within the community. Bright Energy Africa employs farmers to run briquette fabricators in central locations. It leases kilns to local farmers to make biomass char and buys that char back at a higher rate than the kiln lease. BEA also employs unemployed women and youth as commission-based sales agents, who advice families in their network to replace traditional wood charcoal with smokeless briquette for cooking. This community-led model drives acceptance and trust through word-of-mouth within the community network.

Off-site waste-to-energy enterprises have innovative models to incentivize waste collection for energy conversion. CaribShare, a Caribbean off-site waste-to-energy social enterprise (NGO), collects organic food waste from hotels and livestock farms, and converts it into biogas and then into affordable, reliable electricity to serve the needs of communities in rural Jamaica. Participating hotels reduce their waste disposal cost by more than 50 percent as CaribShare picks up their organic waste free of charge and enhances its green/CSR branding. Participating farms receive a cash reward and high-quality fertilizer in return for the cow or pig manure they supply. These novel techniques encourage the hotels and farmers to participate in the waste-to-energy programs.

Accessibility

Waste-to-Energy enterprises tap into the existing rural network to ensure last-mile delivery of their systems. For example, (B)energy has a decentralized hub-and-spoke distribution model wherein it appoints ‘social franchisees’ at a local level and imparts training to them for filling in the biogas in the backpacks. (B)energy also involves local NGOs and convinces them to manage the transportation of biogas systems and thus offset carbon footprints. End users are able to consume or sell the biogas they produce using the (B)energy backpacks (one backpack can produce 3–4 hours of biogas). This innovation has made biogas portable and empowers households to generate, consume and sell biogas, thus increasing accessibility.

Often households are reluctant to invest in a biogas plant because they consider the running and maintenance of the plant highly technical. Some of the standard products may also have parts that are not readily available locally or may not be suitable for installation at their homes. To address this issue, some enterprises provide modular or customizable solutions. For example, India-based Samuchit Enviro Tech provides a do-it-yourself kit consisting of all critical components (biogas stove, feedstock inlet assembly, overflow outlet assembly, drain valve assembly, biogas outlet assembly) along with an instructional video. Tanks and pipes can be purchased locally, and the plant can be installed with the help of any local plumber, thus making the operations easier for the consumer. Similarly, Sistema Biobolsa ensures that it customizes its product to suit each farmer’s requirements and provides suitable training pertaining to its use and implementation. The distribution of these machines is done through micro-entrepreneurs who use micro-finance channels to make distribution easy, convenient and accessible.

Affordability

Some enterprises make their on-site plants affordable by partnering with local governments that offer subsidies to consumers for the use of the systems. For example, the Ministry of Nonconventional Energy Sources (MNES) in India offers a subsidy of USD 60 for each Biotech India domestic plant up to 10 m³ capacity, and the local and district panchayats provide further subsidies—typically USD 60 in urban areas and USD 80 in rural areas (Ashden 2007). Consumers pay the remaining amount directly to Biotech India. A typical family normally uses about 168 kg of LPG a year. Biogas replaces about 50 percent of this

use, or about 84 kg per year, saving the family about USD 53 per year (Ashden 2007). This means that the payback period for the cost of the plant is about three years, which can be shortened if they collect extra food waste from shops to increase their biogas production.

The cost of implementation of biogas technology is significantly lower than for other renewable energy technologies (wind, solar, and hydro) (Carib Share Biogas n.d.), thus making it a cost-effective source of energy for domestic consumption. Many biomass gasifiers produce biogas that can lower the price of energy for small-scale industries that are located in off-grid areas and rely on diesel as a source of energy. For example, Ankur Scientific Energy Technologies in India manufactures biomass gasifier systems that convert biomass such as rice husk, wood and sawdust into a combustible gas mixture (known as producer gas). This gas can replace fossil fuels (coal, natural gas, light diesel oil) in any application (furnaces, oil heaters and boilers). If connected with modified diesel engine-generator set, the producer gas can lower the cost of electricity produced by only diesel, by replacing 70 percent of the diesel.

Some enterprises also provide consumer finance to ensure that customers find their products affordable. For example, Takamoto Biogas (Schutter Energy) provides pay-as-you-go biogas systems in Kenya where their customers (mainly smallholder farmers) pay a small fee to install the biogas system and make mobile payments for the biogas they use. Takamoto monitors the biogas system through a GSM connected smart meter that sends information on unit maintenance and enables the PAYG function according to the customers' credit. Since 2012, it has partnered with Kiva to provide 0 percent interest financing for its clients who cannot afford to pay the full price of a bio-digester upfront (Wright 2016b). Biobolsa has developed a series of questions about number of animals, types of crops, annual payment cycles, size of family, food costs, and education costs to assess the debt servicing capacity of farmers. It has also implemented a Salesforce and Taroworks solution that enables field technicians and sales representatives to enter information on their smart phones in the field and later upload to Biobolsa's Salesforce database once they have an internet connection. The enterprise can thus capture essential information about each customer in remote rural regions and help the credit committee make an informed loan decision (Wright 2016a).

Results and Cost-Effectiveness

Scale and Reach

Off-site enterprises offer a more scalable and cost-effective solution for waste to energy conversion due to economies of scale. However, they are limited by the high capital investment required to start the business. The most commonly seen offsite waste-to-energy enterprises are briquette manufacturers. On-site enterprises are more effective in waste management as they divert waste from landfills. However, many households hesitate to install the plant in their homes due to the stench and space constraints. The most commonly seen onsite waste-to-energy enterprises are biogas plants. In general, the waste-to-energy business model is highly scalable and has the potential to reach thousands of households within a few years of operations. The scale of off-site enterprises can be measured by various metrics such as

tonnage of output (e.g. number of briquettes sold per month), number of customers served (households, industries), number of countries reached etc. The scale of on-site enterprises can be measured by metrics such as number of biogas units deployed, geographies reached, tonnage of waste diverted from landfills etc.

Off-site biogas models achieve better scale and reach in terms of volume to people served. Domestic on-site biogas plants have a volume of 1–12 m³ and serve 5–10 people. Institutional biogas plants (for schools and communities) range in capacity from about 10 m³ to 25 m³ and each serve an average of 250–500 people. Off-site waste-to-energy plants, generally developed in association with a municipal body is around 50 m³ and serves around 2,000–25,000 people (Ashden 2007; Ntiringanya 2016). The manufacture, installation and maintenance of the biogas plants is estimated at 13 days for each on-site domestic plant, 55 days for each off-site institutional plant and 80 days for a municipal off-site waste-to-energy plant. Sistema Biobolsa has installed more than 2,200 Bio-digesters in Mexico and Latin America and treated 150,000+ tons of waste to produce 4500+ tons of biogas (Sistema Bio 2017). Biotech India has completed more than 22,000 household projects, 300 institutional projects, and around 60 electricity projects. The electricity generated is 40kW per year (Biotech India 2017). The total rate of biogas production from all installed plants in 2007 was estimated to be about 16,000 m³/day, which replaces the equivalent of about 1,400 tons/year of LPG and diesel.

Briquette manufacturers generally produce around 100–200 tons of briquettes every month (Simgas 2017). Kampala Jellitone Suppliers (KJS) is Uganda's first producer of briquettes made from agricultural waste that includes sawdust, peanut husks and coffee waste. It has the capacity to produce about 2,000 tons/year of briquettes and sells about 130 tons of briquettes every month to 31 schools, universities and hospitals for cooking and to 5 factories for producing heat. Habona operates at a capacity of 100+ tons of briquettes per month and has the potential to increase it to 300 tons per month (Habona 2017).

Improving Outcomes

Waste-to-energy enterprises create significant impact across many parameters such as carbon dioxide emission reduction, trees saved, time saved from not collecting firewood, health benefits of smokeless energy, and money saved by replacing expensive fuel with lower priced or more efficient fuel. Enterprises providing biogas solutions shared outcome data that highlights the multi-level impacts of this model, in addition to savings or additional income to farmer households.

Use of briquettes reduces the pressure on wood resources, and thus reduces deforestation. In addition, the agricultural residues used to make briquettes were previously burned as they were regarded as waste that posed a fire hazard. Less smoke is produced using briquettes than using wood, and it is removed by the stove chimney. Briquettes need very little space for storage, although it is essential to keep them dry. The Kampala Jellitone Suppliers (KJS) briquette stoves replace firewood or charcoal. One ton of briquette, used in an efficient KJS stove, replaces on average 1.2 tons of firewood and 0.3 tons of charcoal (Ashden 2009). The 1,530 tons of briquettes that the enterprise produces and sells, therefore, saves about 9,300 tons/year of CO₂. Low-income residue producers such as agricultural processors are

Table 32. Scale and reach of select waste-to-energy enterprises

<i>Enterprise</i>	<i>Country</i>	<i>Type</i>	<i>Scale and reach</i>
(B)energy	Ethiopia, Sudan	On-site	• 30 biogas backpacks (GesiShamba) sold through franchises, benefitting 250 people
SimGas	Tanzania, Kenya	On-site	• 800 customers served
Husk Power Systems	India	Off-site	• 15,000 households in 400 villages in rural India
Renewable Urja	India	Off-site	• Capacity of 15,000 tons of briquettes per year, serving around 0.1 million rural households • Employment of 400 people, mostly women
SGFE	Cambodia	Off-site	• 1,000 rural customers and 1,000 urban customers served
Clean India Ventures	India	Hybrid	• 25 machines installed, serving around 8,000 people
Skylink Innovators	Kenya	Hybrid	• Sold up to 200 domestic biogas plants and 6 large-scale ones, benefitting 5,200+ people

Sources: (B)energy 2017; SimGas 2017; Husk Power Systems 2017; Renewable Urja 2017; SGFE 2017; Clean India Ventures 2017; and Skylink Innovators 2017.

paid USD 3–14 per ton of residue, giving them an additional source of income. Habona in Rwanda produces briquette that has a calorific value of 12–15 kiloJoules, whereas the calorific value of wood/charcoal is 3–6 kiloJoules.

Some enterprises create large-scale impact by implementing mini-grids in rural areas that complement the national power grid. While these are more mature and larger enterprises, they highlight the potential of how waste-to-energy models can achieve impacts beyond only

Table 33. Impact of select waste-to-energy enterprises

<i>Enterprise</i>	<i>Impact created</i>
Takamoto Biogas	<ul style="list-style-type: none"> • Helps save around 3000 trees from getting cut each year • Avoids 1 MT CO₂ equivalent emissions • Saves a total of 331 man-hours spent in collecting firewood per day
SimGas	<ul style="list-style-type: none"> • Saves on average USD 250 per household per year on energy expenditure (SimGas 2017) • Each woman saves 2-4 hours a day by not collecting firewood
Sistema Biobolsa	<ul style="list-style-type: none"> • Treated 2.4 million tons of animal waste to produce 4,500+ tons of biogas and mitigate 17,000+ tons of CO₂ • With a bio-digester, farmers can replace costly chemical fertilizers with bio-fertilizer, saving USD 260 per year for a farmer with 3 hectares of land • Farmers can reduce or eliminate the amount of LPG they have to buy to power their homes and farms, resulting in savings of USD 28-40 per month

managing waste. For example, Husk Power Systems, an off-site waste-to energy enterprise in India, generates electricity using a biomass gasifier that creates fuel from rice husk. Each plant generates 32 kW of electricity from 50 kg (110 lb) of husks per hour, enough to meet the basic energy needs of about 500 households, although there are several systems with higher generating capacity (Borenstein 2011). Each plant saves approximately 42,000 liters of kerosene and 18,000 liters of diesel per year, significantly reducing indoor air pollution and improving health conditions in rural areas. It currently has 100+ operational plants in rural India, serving more than 200,000 people across 350+ villages. Husk Power extends villagers' activities beyond daylight hours, reduces indoor air pollution, increases the time children can study, reduces the amount of time women spend collecting firewood, and reduces emissions.

For most domestic users, the main benefit of an on-site biogas plant is the easy, hygienic disposal of food waste and the savings made in LPG use. Operators of institutional plants are pleased with the absence of odor in the neighborhood. For the markets and councils, the removal of food waste and the associated public health risks is a great advantage. The effluent or residue in the biogas plant makes good fertilizer which results in higher farm yield.

Cost-Effectiveness

Waste-to-energy enterprises step in when local governments and the public sector are unable to effectively manage waste. Since waste-to-energy enterprises achieve impact across different parameters, particularly those such as health of vulnerable populations, women and children, their cost effectiveness is difficult to ascertain. However, enterprises that produce biogas or briquettes are ensured of a market for their energy products, and can ensure impact at a relatively reasonable cost, mostly similar to the charcoal wood costs. As technology for efficient processing of waste into energy develops, the costs are likely to be lower than other traditional fuel.

Most waste-to-energy plants that manufacture briquette also produce organic compost that can be used as fertilizer. Several enterprises shared their cost and price of briquette and compost, indicating that they are able to earn reasonably while ensuring efficiency gains and cost savings for their customers. Habona, a waste-to-energy enterprise in Rwanda, collects waste from waste management plants using equipment that separates wet and dry waste to be used for making briquettes, biogas and compost. Each kg of briquette is sold to domestic clients for USD 0.25 (RWF 200) and lasts 3 times longer than charcoal of the same price. The price of briquette per kg for institutional clients is USD 0.05 (Habona Biogas 2017). The price of the compost is USD 40 per truck, i.e., USD 13.5 per ton*. Bright Energy Africa (BEA), a Tanzania based enterprise, makes briquettes that are over 40 percent cheaper and last 35 percent longer than normal charcoal. Cooking using briquettes costs about the same as using firewood—the higher cost per ton of briquettes is balanced by the higher energy density and stove efficiency. Customers also find it easier to transport and store BEA briquettes, since they need a smaller volume per week. Similarly the briquette produced by Habona is around 40 percent cheaper than other substitutes such as wood and charcoal.

* Each truck carries around 3 tons of compost.

Some enterprises have adopted unique energy provision models that make the solution cost-effective for consumers. The cost-effectiveness is however, a function of local availability and price of raw material. In the case of Husk Power Systems, the rice husks used to fuel the process are purchased from local rice mills for less than USD 20 per ton. The cost of installation of a single biogas system is as low as USD 100 per kW. It further reduces costs by running insulated wires along bamboo poles directly to households, businesses and farms. For seven hours of electricity, the enterprise charges USD 2–2.5 per household per month, on an average. The enterprise has also installed a remote plant monitoring system to monitor plant performance via Internet. It also has a pay-as-you-go system with pre-paid meters available at USD 12–15 that allows customers to pay on a monthly basis (Gaurav n.d.).

Although very nascent, a few breakthrough technologies are being commercialized to convert waste into low-cost petroleum fuel. While their cost effectiveness is still being proven, these technologies have the potential to be disruptive. For example, Ventana, a waste-to-energy enterprise based in California with R&D in India, deploys a patent-pending, continuous de-polymerization process to convert waste plastics to petroleum fuels similar to diesel and gasoline. Most competing variants deploy capital-intensive systems to convert waste plastics to a mix of synthetic crude oil, waxes and slurries which have limited offtake and low economic value. Ventana has disruptively down-shifted the capital cost of plant and machinery from USD 10–20 million for a 20 tpd (tons per day) plant (Borpuzari 2014).† The technology helps waste management companies save on disposal costs (USD 40–100+/ton) while additionally netting them cash flows of USD 200–250+ per ton of waste plastics (Tandon n.d.). Similarly, Sustainable Technologies & Environmental Projects (STEPS) in India, has developed two innovative technologies to produce liquid fuel. The algae-to-diesel technology converts algae found in water bodies into hydrocarbon diesel (1 ton of algae yields 500 litres of fuel) and bio-char, which has a high commercial value for use as cooking fuel (STEPS, Algae, n.d.). STEPS' Polycrack technology converts waste plastic into petroleum fuels. This fuel can be further converted into various fractions like petrol and diesel. (1000 tons of waste can produce 120 tons of oil) (STEPS, Rao, n.d.).

Scaling Up

Challenges

Waste-to-energy enterprises face a number of challenges related to operations, funding, distribution and customer outreach. Capital to establish the plant and fuel operations seem to be the leading challenge. Habona lacked funds to ensure an adequate number of vehicles to transport waste to the treatment plant. It also faced some difficulty in mobilizing funds from investors and convincing them of the benefit of its technology. Its project to generate power from gas so as to complement the national power grid required an initial investment of around USD 50,000. Eventually, it received award money from the 2014 Young Innovator

† The enterprise prefers to keep the price of its solution confidential, and has not shared it with the research team.

Award in Rwanda, African Innovation Prize and 2015 Mandela Washington Fellowship in USA, which it used to implement the plant.

Waste-to-energy plants need maintenance support, and often face technical problems that need a dedicated technical staff. Enterprises find it difficult to hire and retain such staff close at hand in all their locations. For example, Biotech India occasionally faced minor problems with blocked gas pipes (or pipes chewed through by rats), water condensing in pipes, and broken tap fittings, which were quickly fixed by its engineers. Biogas cookstoves also have a life of two to three years on an average and have to be replaced at a cost of USD 50 (SimGas 2017). Briquette manufacturing also causes considerable wear in the machines due to the high pressure, and the pistons and dies have to be changed regularly.

In many cases, enterprises have to work hard to overcome people's expectations that waste-to-energy solutions have to be necessarily subsidized by Government programs. A huge amount of donor funding often distorts the market for private sector players and competing with highly subsidized LPG (a substitute for biogas) is difficult ((B)energy 2017). Clean India Ventures faced a challenge with the mindset of the people who assume that waste management is the Government's job, and so, despite having small-scale plants in nearby localities, would not dispose waste at the plants.

Role of Government and Policy

Governments in developing countries are keen to support the waste-to-energy business model because it addresses two of their most pressing problems—that of energy access and dependence on fossil fuels, and waste management. In India, the Ministry of Nonconventional Energy Sources (MNES) offers a subsidy of USD 50 (INR 3,000) for each domestic plant up to 10 m³ capacity, and the local and district *panchayats* provide further subsidies—typically USD 50 (INR 3,000) in urban areas and USD 70 (INR 4,500) in rural areas (Ashden 2007). The Government of India has set itself a target to generate 700 MW energy from waste by 2019 (Messenger 2016). For this, it has instructed the distribution companies to purchase power from any city generating energy from waste. The Government of India is also working towards reducing interest rates on loans for waste-to-energy projects. In Thailand, the Energy Regulatory Commission is planning to add up to 50 MW of waste-to-energy power capacity to cut down the country's reliance on natural gas and is partnering with private companies to build, operate and transfer the plants (Jittapong 2016). In Ethiopia, the UK-based Cambridge Industries and China National Electric Engineering Corporation are undertaking a USD 95 million project to generate 50MW of electrical energy in collaboration with the Addis Ababa city administration.

However, clarity on policy governing privately-owned waste-to-energy mini-grids is important. Enterprises often invest considerably in a new market, only to find that the national grid is moving into the same market. Availability of low-cost grid electricity impacts the financial viability of waste-to-energy enterprises. Lack of regulatory clarity has adversely affected Husk Power System that had to shut 3 plants after consumers moved to the centralized grid in their area of operations. Centralized grids may jeopardize the viability of mini-grids as consumers prefer power from the government. In such cases, mini-grids should be allowed to feed in power into a central grid at a fair tariff (Jha 2015).

Conclusion

The severe lack of existing municipal infrastructure and capacity to support efficient solid waste treatment in most developing countries indicates the potential opportunity for waste-to-energy enterprises. The dual impact of the waste-to-energy model in mitigating climate change and in serving as an energy resource makes a strong case for increased investment into this model.

On-site waste-to-energy enterprises are highly scalable and replicable given that these systems are easily portable and can be used to treat a wide range of organic waste including agricultural and domestic kitchen waste. Financial viability of such enterprises hinges on consumer awareness and uptake; the number of customers reached determines the extent to which system manufacturing costs are covered. The viability of off-site enterprises relies largely on the support of governments to cover capital costs incurred in setting up processing plants. Most off-site enterprises increase their scale of operations by leveraging partnerships with governments under their waste management programs. However, the scalability of the model is threatened by alternative renewable energy sources such as solar power and wind power that currently garner more attention than biogas or biomass energy sources.

Table 34. Social enterprises: Waste-to-energy

<i>Company</i>	<i>Country</i>	<i>Solution description</i>
Abellon Clean Energy	India, Canada, Ghana, Italy	Abellon Clean Energy is involved in collection of municipal, industrial, agricultural and forest waste and converting them into different forms of energy (solid fuel, liquid fuel, gaseous fuel).
Agro Biogenics	India	Agro Biogenics recycles food materials such as processed foods and fodder and non-food resources such as engineered composites and products to bio-energy, bio-petrochemicals, bio-fertilizers and bio-water.
Ankur Scientific Energy Technologies	India	Ankur Scientific Energy Technologies converts agri residues (e.g. corn cobs, jute sticks, coconut husk, rice husk, coffee husk, groundnut shells) into energy through biomass gasification.
(B)energy	Germany, Ethiopia, Sudan	(B)energy converts organic waste (animal dung, kitchen waste, human feces, agricultural residues) and liquid waste (water, waste water, urine) to biogas and fertilizer. It supplies biogas production unit, which is semi-mobile, quick to install and affordable.
Biotech India	India	Biotech is engaged in the implementation, promotion, popularization and research in bio-waste management, non-conventional energy and energy conservation programs.
Bright Energy Africa	Tanzania	Bright Energy Africa produces and distributes biomass briquettes from agricultural waste and uses youth and women as briquette sales agents in their communities. The company offers training, kiln leasing and briquetting technology for farmers as well as marketing support for retailers.
CaribShare Biogas	Jamaica	CaribShare is a social enterprise that converts organic waste from hotels and farms into biogas to produce clean energy and to help serve the development needs of the Caribbean.
Clean India Ventures	India	Clean India Ventures manufactures re-processors to produce valuable products from waste. The waste re-processors upcycle most of the organic waste like garden waste, temple waste, kitchen waste and vegetable waste into organic compost and liquid fuel.
Habona	Rwanda	Habona collects waste and converts it to Biogas and Biomass Briquettes and sells them to lower income populations at affordable price.
Husk Power Systems	India	HPS takes agricultural waste, rice husks otherwise left to rot, and converts it into gas that powers an off-the-shelf turbine to generate electricity.
Kampala Jellitone Suppliers	Uganda	Kampala Jellitone Suppliers (KJS) is Uganda's first producer of briquettes made from agricultural wastes that includes sawdust, peanut husks and coffee waste.
Rural Renewable Urja Solutions Pvt. Ltd.	India	Rural Renewable Urja Solutions makes biomass briquettes using forest residues. (These briquettes are then supplied to brick kilns manufacturers, boiler operators for steam generation, and food processing industries that use coal for heating purposes.
Samuchit Enviro Tech Pvt. Ltd.	India	Samuchit Enviro Tech offers customised biogas plants for kitchens, for converting kitchen/food waste into cooking energy.

Table 34. Social enterprises: Waste-to-energy (continued)

<i>Company</i>	<i>Country</i>	<i>Solution description</i>
Schutter Energy Ltd (Takamoto)	Kenya	Schutter Energy is a social enterprise that designs and manufactures biogas systems, which also generate quality biofertilizer. It sells biogas system under the brand name of Takamoto.
SGFE (Sustainable Green Fuel Enterprise)	Cambodia	SGFE (Sustainable Green Fuel Enterprise) works to reduce deforestation and improve waste management in urban areas, by developing a local economic activity: manufacturing charcoal using organic waste.
SimGas	Netherlands, Kenya, Tanzania, Rwanda	SimGas offers a range of biogas digesters and appliances suitable for different situations and requirements, from households to small enterprises and institutions. Its farm waste systems (GesiShamba) are designed for livestock farmers such as cattle holders
Sistema Biobolsa	Mexico	Sistema Biobolsa is a system that converts manure into biogas and natural fertilizers.
Sustainable Technologies & Environmental Projects Pvt. Ltd (STEPS)	India	STEPS provides management and disposal of unsegregated waste at source through the Polycrack technology. The Polycrack reactor treats unsegregated garbage and converts it into gas, oil and carbon.

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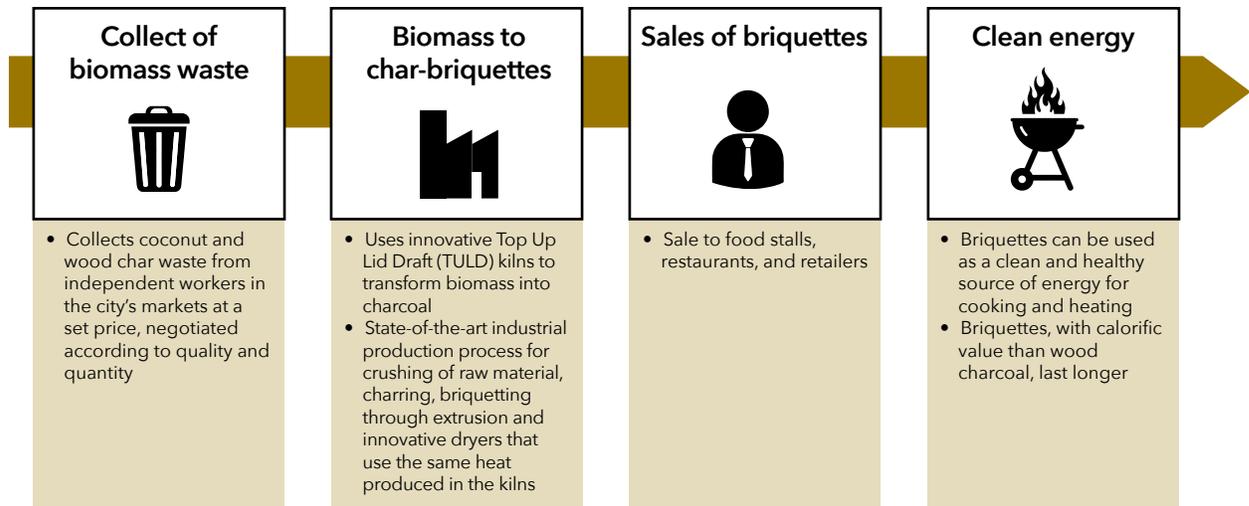
	<p>PROFILE</p> <h2>Sustainable Green Fuel Enterprise (SGFE)</h2>
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<p>Founding year: 2008 HQ: Phnom Penh, Cambodia Countries of operation: Cambodia</p>	<p>Orientation: For-profit Employees: 30 Turnover: USD 250,000</p>
<p>Sustainable Green Fuel Enterprise (SGFE) aims to provide an alternative sustainable cooking fuel (renewable and clean energy) to the Cambodian population to replace traditional charcoal. SGFE has set up a factory producing char-briquettes from biomass waste, and hires workers from the poorest segments of the population, mostly waste pickers in the informal sector, and provides them with social working conditions (salaries, health care, safety, etc.)</p> <p>By selling its char briquettes, SGFE contributes directly to the prevention of the deforestation caused by traditional charcoal production. Since SGFE’s raw materials derive from recycled biomass waste, each ton of SGFE’s char-briquettes leads to a reduction of 1,645 tons of CO₂ emissions. In 2011, SGFE achieved a CO₂ emission reduction of about 9,300 tons (sales of 670 tons of char-briquettes).</p>	

Operating Model

Cambodia has one of the worst rates of deforestation in the world. It lost 2.9 million hectares of forest (14 percent of its land area) from 1990 to 2010.* Much of the Cambodian economy depends on wood, for timber, heat and power generation, and about 80 percent of households use wood or charcoal for cooking. Moreover, Cambodia is faced with an acute shortage of electricity (60 percent imported in 2012) and regular power cuts. As a result, the Government of Cambodia licenses and encourages private generators, including those using wood gasifiers. The char from the gasifiers is currently considered as waste. Sustainable Green Fuel Enterprise

* https://www.ashden.org/files/case_studies/SGFE_percent20case_percent20study_0.pdf



(SGFE) is trying to solve both the problems—lack of clean cooking energy and improper disposal of wood-char from gasifiers.

SGFE is a social enterprise that started in 2008 as a result of a joint project of two NGOs—Group for Environment, Renewable Energy and Solidarity (GERES), which was the technical partner, and Pour un Sourire d’Enfant (PSE) which was the social partner. It became an independent private company in 2012. Since then, SGFE has gradually achieved financial sustainability, breaking even in 2013 and making a profit in 2014. SGFE produces high-quality char-briquettes from waste, replacing the need for wood charcoal, and thus reducing deforestation. It purchases biomass materials, which would otherwise go to waste landfills, and converts them into high-quality char-briquettes that are sold as a direct replacement to conventional charcoal, for cooking in homes and restaurants.

The enterprise currently uses char waste from wood-fired electricity generation, which SGFE buys from businesses that run the generators, and coconut shells, which SGFE buys from traders and converts into char in its own clean-burning kilns. Because coconut char makes higher quality briquettes, SGFE has also started selling coconut shells to some electricity generators, with a buy back arrangement for their waste coconut char.†

SGFE delivers about 30 percent of its production to retailers and 40 percent to restaurants and food stalls. The remaining 30 percent is bought directly from the factory by charcoal distributors for re-sale. Around 100 shops, many of which used to sell charcoal, now sell SGFE briquettes. Around 150 restaurants and food stalls use the briquette. SGFE leverages tuks-tuks (three-wheeler public transport) to distribute and advertise its products. SGFE’s most effective marketing strategy is providing free trial samples to restaurants and distributors. It creates awareness among families through focus group discussions (SGFE 2017).

† Waste biomass like coconut husks and shells are burned for two hours in refractory brick kilns until the material is carbonized. The production process has been modified to be as energy efficient as possible; the kilns used to carbonize the coconut and biomass ensure efficient combustion, reducing the emission of harmful gases and air pollution. The energy generated by the carbonization process is recovered and used to increase efficiency.

Financial Sustainability

In 2014, about 53 percent revenues were from sales of products and services, 28 percent from grants and 19 percent from sales of carbon credits[‡]. However, SGFE has progressed on the path of financial sustainability from core operations to achieve 98 percent revenues from sales and only 2 percent from the sale of carbon credits in 2016. It has not applied for or received any grants this year. The major cost components for SGFE include raw material and human resources.

SGFE produces its top brand ‘Diamond’ briquettes only from coconut char, and ‘Premium’ brand from 5 percent coconut char and 95 percent char residues. Both have higher carbon content than traditional wood charcoal, and produce more heat per kg. In addition, both contain less volatile material and less ash content, and therefore, produce less air pollution. Although the prices of SGFE produced briquettes are slightly higher than those of the traditionally used charcoal, the briquettes burn for a longer time due to their higher calorific value. This reduces the average cost for the consumer vis-à-vis traditional charcoal.

SGFE has received USD 0.3 million grant from the Spark Fund of the Global Alliance for Clean Cookstoves. It is also in the process of raising equity investment to scale up production capacity and expand to overseas markets. As the effective price of SGFE’s briquette fuel is same or below the price of wood charcoal, it is highly competitive resulting in a low substitution cost for the consumer. SGFE’s profits are reinvested into the company’s assets and fairly distributed among the employees to maximize social impact.

Impact

SGFE char-briquettes are 100 percent recycled biomass, have a longer burning time (higher fixed carbon content), they make no sparks (which can cause domestic fires), make no smoke (which cause respiratory diseases in indoor cooking) and come already in a small cut, easy-to-use size and shape. The briquettes are less fragile, so they are easier and cleaner for both users and traders to handle and store. At the end of the day, any remaining fuel can be extinguished in an air-tight container and used again the next day.

Each ton of char-briquettes replaces the use of about 10 mature trees (7 tons of dry wood). With its monthly sales exceeding 100 tons, SGFE saves over 700 tons of wood per month, which is not cut from Cambodia’s forests and reduces CO₂ emissions for almost 20,000 tons per year. Users of SGFE briquettes save around USD 60 per year, because the briquettes produce more heat and less waste than wood charcoal (SGFE 2017). Greenhouse gas emissions are cut by replacing non-sustainable wood with biomass from waste. They are reduced further by the use of top-lid-updraft gasifier (TLUD) kilns, which cut the emission of non-CO₂ greenhouse gases.

SGFE also generates sustainable livelihoods by employing factory workers from the informal sector. The workers are from families that sort waste on rubbish dumps and do not have formal employment. These workers are selected through a children’s charity called Pour un Sourire d’Enfant (PSE), which ensures that the children of these workers are enrolled in

[‡] https://www.ashden.org/files/case_studies/SGFE_percent20case_percent20study_0.pdf

PSE-supported schools. SGFE pays a salary of USD 150–200 per month, and an additional USD 25–30 on health insurance and bonuses. SGFE and PSE work together to provide job and life skills training to the employees. In addition, SGFE often hosts factory visits for Cambodian and international school and university students, with the aim of increasing awareness about clean energy, environmental protection and social inclusion (WAME 2008).

Challenges and Lessons

SGFE started its operations in January 2010, and by the end of 2011, SGFE was already facing the risk of closure, since the founding NGOs, who were subsidizing SGFE's finances, had terminated the budget dedicated to the project. The current owner (Mr. Carlo Figà Talamanca) took SGFE over in January 2012 to try to save it from closure. Through production management, renewed marketing strategies and development of its supply chain and distribution system, SGFE succeeded in breaking even within two years, increasing production and sales by tenfold, from 5 to 50 tons/month by 2014. In the following two years, SGFE was able to grow by 100 percent again, reaching production and sales of 100 tons/month in 2016 (SGFE 2017).

Road Ahead

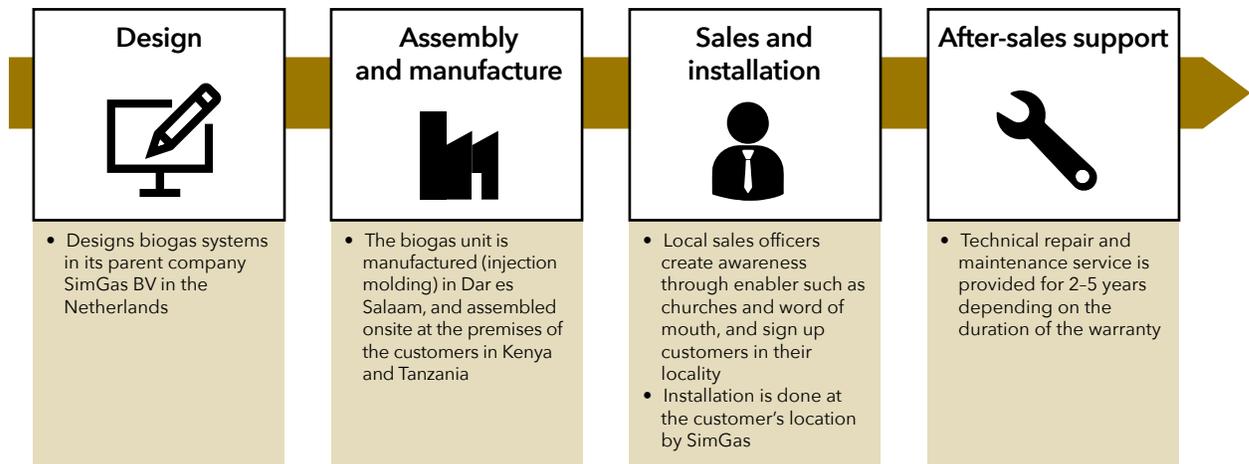
SGFE has been able to increase the production capacity up to 135 tons per month in its current location. The projected sales of briquette for 2016 is 850 tons, which will reduce carbon emission of around 14,000 tons (SGFE 2017). SGFE is looking to expand its production capacity by building a bigger production plant through capital infusion by an impact investor. SGFE also plans to expand geographically to Africa by exploring a franchise model based on equity, in which it will provide initial capital outlay and technical assistance to waste-to-energy firms in return for equity.

	<p>PROFILE</p> <p>SimGas Kenya Ltd.</p>
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<p>Founding year: 2009</p> <p>HQ: Netherlands</p> <p>Countries of operation: Tanzania, Kenya</p>	<p>Orientation: For-profit</p> <p>Employees: 70</p> <p>Turnover: USD 1–2 million</p>
<p>SimGas is an innovative design and production company focused on delivering affordable small-scale biogas systems to customers in subtropical regions. These systems are fed with manure, kitchen waste, and agricultural waste. SimGas offers a range of biogas digesters and appliances suitable for different situations and requirements from households and small enterprises to institutions like schools. These systems are pre-manufactured, modular, expandable, and easy to install. By providing clean and affordable energy, SimGas offers household tools to improve their lives and income positions. The users save time and reduce a large share of their energy expenses. Biogas is a clean and sustainable source of energy and contributes to healthier indoor climate, reduced reforestation, and reduced carbon emissions.</p>	

Operating Model

Worldwide, 3 billion people get exposed to toxic fumes, fuels and dangerous open fires while cooking their meals (Africa Carbon Forum 2017). The direct consequences of inhaling toxic fumes cause 4 million people to die each year of lung cancer. In East Africa, cooking on charcoal and wood is the number-one cause of death, even before HIV/AIDS and malaria. Mostly women and children are victims of toxic gasses inhaled when burning fires indoors. Also, deforestation, driven by a high demand for wood, depletes Africa’s forest cover by 1–2 percent per year. CO₂ emission, caused by traditional cooking methods, aggravates the greenhouse effect felt around the world. Biogas is a clean cooking fuel and can address these problems. However, conventional biogas systems in East Africa are large, expensive and



cumbersome to build. SimGas, a waste-to-energy enterprise, has introduced a small-scale and mass-producible biogas system that is pre-manufactured and adapted for households.

SimGas biogas systems are fully integrated farm solutions, targeted at smallholder farmers. The system uses anaerobic digestion, where bacteria work symbiotically to convert organic waste into biogas. Slurry that has been fully digested exits the biogas system in the form of organic fertilizer. The biogas that is produced is a clean fuel that can replace wood fuel, charcoal and kerosene for cooking and other energy needs. The installation of the pre-fabricated kit takes one day compared to six man-weeks for a conventional system.

SimGas products are made from recycled HDPE plastic and modular. They can be scaled from 2m³ to 25m³ (in 1m³ increments) for farmers with 1 to 30 cows. SimGas distributes the systems through retailers, and partners with local institutions and events like churches to create awareness about the products. At the time of sale, SimGas advises farmers on the size of biogas system they should go for based on the specific situation, like the number of farm animals.

SimGas has a network of customer service centers, in addition to 8 offices in Kenya and 4 offices in Tanzania. There are local sales officers who sell within 20 km radius and also support in the after-sales service. SimGas has 11 employees in the Netherlands and around 60 employees in Kenya and Tanzania.

The digesters are developed and designed by SimGas BV in the Netherlands and local partners and experts. SimGas is also supported by a number of major businesses and farmer support organizations, including CRDB, NMB, HEIFER and Tanga Fresh Ltd. It also partnered with Kenya Bureau of Standards to co-develop the standards on energy. In addition, SimGas has joined the Africa Biogas Partnership Program (ABPP), a PPP led by Hivos and SNV in supporting national programs on domestic biogas. The national biogas programs provide training to technicians on installation of brick and cement systems. SimGas leverages these skilled workers for installation of SimGas systems. SimGas is paid on the basis of the results, wherein the outcome is a target of installing a certain number of biogas systems in a stipulated period. SimGas has also entered into a similar strategic partnership with Tanzania Domestic Biogas Program to install the biogas digester systems in households.

Financial Sustainability

SimGas incurred an initial fixed investment (capital expenditure) of about USD 1.3 million on setting up its factory. Manufacturing the systems constitutes around 50 percent of the costs while the remaining 50 percent were incurred on transport, staff, installation and other miscellaneous costs. It earns revenues from selling the biogas system that comprises of cook-stoves and other components. SimGas biogas systems (including biogas stove of around 5 cubic metres, installation materials, user training, delivery & installation, after sales service, and a 2-year warranty) are priced at USD 500–1000, varying with different countries (due to transport costs) and the size of the systems. Price of SimGas biogas systems are lower than that of competitors. However, the selling price of SimGas systems is slightly higher than the prices of Government-promoted biogas systems because the Government does not charge installation costs. However, the material costs of SimGas systems is lower than those of the Government-promoted systems.

SimGas has signed an Emissions Reduction Purchase Agreement (ERPA) with World Bank's Carbon Initiative for Development (Ci-Dev) on the purchase of 500,000 Certified Emission Reductions (CERs)—commonly known as carbon credits—generated by SimGas' biogas systems in Kenya. The emission reduction is calculated based on the emission of the replaced energy sources like charcoal and woodfuel. Thus, this additional revenue stream serves as a subsidy (an average of 8 carbon credits are sold per system), lowering the retail price of biogas systems for households and thereby increasing the affordability of these systems to these families. SimGas is also able to extend the warranty on biogas systems from 2–3 years to 5 years, thereby increasing customer confidence in SimGas' systems. It expects the digesters to be bought by around 80,000 households initially in Kenya, which would otherwise use 3–7 tons a year of firewood to cook, much of it from unsustainable sources.

SimGas has received equity and debt capital from impact investors, and has also won awards such as the Open IDEO and Empowering People Award from the Siemens Foundation. The external funding and the carbon credits program help SimGas to remain sustainable, though profitability is limited because it is a triple-bottomline company and maintaining affordability for farmers is important.

Impact

Biogas not only takes away the health hazards of indoor air pollution, but also saves time (about 2–4 hours a day). Using biogas lowers household energy expenditure and makes households independent of unreliable or non-existent power grids disbursement. Globally, an estimated 18 million acres of forest are lost each year for fuel wood. Replacing woodfuel by biogas reduces deforestation and helps to lessen global greenhouse gas emissions. SimGas can measure impact by remotely monitoring system performance and carbon emission reduction. Cooking on biogas reduces carbon emission with a 5–10 ton CO₂ equivalent per household per year. This is about as much CO₂ as an average passenger car emits in two years and translates into energy savings of around USD 80–300 per hh/year, depending on previous fuel use.

Challenges and Lessons

Operational expenses in hiring staff and installation technicians are hurdles for the expansion of SimGas. It has faced some technical challenges in availability of electricity for production and materials. Consumer financing has also been a challenge; SimGas initially worked with MFIs, but the arrangement did not last due to high interest rates and complexity of the products.

Road Ahead

SimGas plans to expand to East Africa in countries such as Uganda, Zambia, Ethiopia, and also to South Asia in countries such as India and Bangladesh, where people require clean energy solutions. SimGas also plans to introduce a pay-as-you-go / lease-to-own model for its products by setting up a revolving fund.

SimGas also plans to introduce two other products. It is developing a biogas-based milk chilling machine for farmers that will provide off-grid biogas-powered milk cooling on-farm, allowing smallholder dairy farmers without access to electricity to store, deliver and sell the highest possible quality of raw milk, and increase their income. SimGas is also developing a safe bio-sanitation system to convert human faeces to energy and improve health and hygiene for schools and institutions.



Providing Decentralized Wastewater Treatment

Enterprises have developed integrated, affordable wastewater treatment solutions for industries and households to encourage reuse or safe disposal

HIGHLIGHTS

- Wastewater treatment enterprises treat water before disposal or recycle the water so that it can be reused.
- Enterprises provide household wastewater treatment systems that are modular, have low operating costs in terms of electricity and maintenance, have silent operation and less odor and offer quick returns on investment.
- Enterprises focusing on industrial wastewater treatment solutions offer efficiency and cost effectiveness. They are quickly commissioned, fully automatic, have remote monitoring, require minimal hazardous chemicals, and treat water for reuse.



Summary

Wastewater sources include domestic wastewater—pertaining to liquid outflow from toilets, bathrooms, basins, laundry, kitchen sinks and floor washing, and industrial wastewater—effluent water that is discharged during manufacturing processes in factories or by-products from chemical reactions. There are significant operational and financial challenges associated with wastewater treatment in marginalized residential communities, where domestic wastewater does not get treated at source, but instead is discharged to local municipal facilities or directly into water bodies. Similarly, industrial wastewater is heavily contaminated and leads to pollution and diseases, if disposed without treatment. It may also contain metals that have high market value and could potentially be recovered.

Social enterprises have introduced unique technologies and integrated solutions to treat such wastewater either for safe disposal or for reuse. These solutions aim to be efficient,

affordable and convenient. There are two major types of wastewater treatment plants—household (residential) systems and industrial systems.

Development Challenge

In a developing urban society, wastewater generation usually averages 30–70 cubic meters per person per year. Thus, a city of one million people can generate wastewater that would be sufficient to irrigate approximately 1,500–3,500 hectares (Jhansi and Mishra 2013). Unfortunately, in developing countries, approximately 90 percent of wastewater is untreated when discharged (Wachira 2016). Water pollution causes illness and accounts for 50 million deaths per year worldwide, especially in Africa and Asia (Hanski 2017).

Wastewater management is increasingly becoming a priority issue in developing countries; accelerating urbanization exacerbates the situation resulting from inadequate systems, technology and infrastructure. In most developing countries, wastewater treatment is the responsibility of the local Government. Municipal treatment of household sewage involving large collection networks and treatment plants incur enormous costs and considerable time for construction. These centralized treatment plants are also often economically unviable as they require investments in collection and conveyance of wastewater via piped networks. Due to the dependence on “end-of-pipe” wastewater treatment instead of on-site residential wastewater treatment technologies, the reuse rate is less. This is because end-of-pipe treatment is generally operated at locations away from the source of municipal supply, and transporting recycled water may be costly and inefficient.

Similarly, there are challenges in treating industrial wastewater. Manufacturing units generate large volumes of effluents, which include toxic and hazardous components such as feedstock materials, by-products and product residues, washing/cleaning agents, solvents, and other products like plasticizers. When left untreated and unattended, such industrial effluents pose a huge threat to the environment, including soil health deterioration, water table contamination, and other potential health hazards. Wastewater treatment allows human and industrial effluents to be disposed of without danger to health or damage to the environment. Treated wastewater can alleviate water supply challenges, and be used for non-potable purposes such as agricultural and landscape irrigation, industrial processes, toilet flushing, and recharging groundwater basins. Water reuse allows communities to become less dependent on groundwater and surface water sources, and can decrease the diversion of water from sensitive ecosystems.

Business Model

Wastewater treatment is deployed by a broad range of industries and government bodies such as municipalities for safe disposal or recycling of water. Some industries that use wastewater treatment systems include pulp and paper industry, food and beverage industry, marine industry, poultry and aquaculture, healthcare, and chemicals. Municipal wastewater treatment and the food and beverage processing industry form the major share of the market. Water scarcity, energy savings, and increasingly complex industrial wastewater

treatment demands are pushing companies to implement new techniques to optimize environmental and economic performance.

For many small and medium enterprises and residential blocks, conventional wastewater treatment systems are very technically sophisticated and expensive. The conventional systems often rely on high-energy inputs for operations and require extensive maintenance services. In order to address this challenge, there is a growing market for decentralized wastewater management systems (systems that treat and disperses wastewater from individual homes or a cluster of homes at or near the source of the wastewater discharge) for residential households too. These systems allow wastewater to be recycled and reused for daily water needs such as washing, bathing and cooking. Such onsite and decentralized wastewater treatment systems can also support water resource management goals in many arid areas of the country. Their use complements existing infrastructure in situations where centralized sewerage is impractical, unaffordable, or water reuse is desired. They are compatible with municipal wastewater treatment infrastructure and can provide pretreatment and sewer mining support, in addition to serving as an alternative where centralized plants have reached or exceeded capacity.

Household wastewater treatment

Many social enterprises have developed solutions that not only address domestic wastewater disposal, but also facilitate recycling of the wastewater such that it can be used for cleaning, irrigation, flushing and other non-drinking purposes. These enterprises treat both greywater

Figure 24. Household and industrial wastewater treatment

Why?	<ul style="list-style-type: none"> Household wastewater (i.e., sewage) from toilet, kitchen, laundry, etc. contains harmful bacteria/viruses and chemicals that contaminate land and water bodies and may lead to outbreak of waterborne diseases Municipal centralized collection and treatment of domestic wastewater can be cost-prohibitive and decreases reusability of water 	<ul style="list-style-type: none"> Industrial wastewater (i.e., effluent) contains heavy metals which need to be extracted, not only because they are toxic and hazardous, but also because they may be valuable Small commercial setups, required to comply with environmental regulations find it difficult and expensive to treat wastewater
Development challenges		
What?	On-site conversion of waste to energy	Off-site conversion of waste to energy
Components		
How?	<ul style="list-style-type: none"> Social enterprises offer ready-to-use sewage treatment solutions to societies/apartments They deploy innovative technologies to make the product sustainable, cost-effective, and energy-efficient The treated water is used for non-potable applications like toilet flushing, gardening, construction, and filling of water ponds 	<ul style="list-style-type: none"> Enterprises provide end-to-end solution for extraction of hazardous/valuable components from wastewater Generally, the technology is such that the plants can be installed with minimal on-site fabrication, space requirement and manual operation Advanced treatment plants are automated and are energy-efficient, making them cost-effective
Key activities		
Examples	<ul style="list-style-type: none"> Wetland Works!, Ecosoftt, Grey Water (Jaldhara), Greenvironment Innovation and Marketing, AcuaCare 	<ul style="list-style-type: none"> Agua Inc., Bridgedots, India Green Services, SKS Infrastructure, Vision Earth Care, Saha Global

(wastewater from non-toilet plumbing fixtures such as showers, basins, and taps) and black-water (water that has been mixed with waste from the toilet, kitchen, and dishwashers). The household systems generally have a capacity that ranges from 1.5 m³ to 150 m³ and serve 1–20 households or small enterprises (BORDA 2017).

Some solutions also use unique biological treatment methods to treat water from commercial buildings. Vision Earth Care, a, India-based startup, uses a unique soil biotechnology (SBT) process to provide water treatment and reuse for hotels, resorts, hospitals, and railways. Its treatment plants incur operational and maintenance costs that are 60 percent lower than a conventional sewage treatment plant. It uses a novel high-efficiency natural oxidation process that replaces the use of heavy blowers for oxidation in conventional technologies. The recycled water can be used for water-demanding activities such as toilet flushing, gardening, irrigation, construction work, and car washing. Because of its high oxygen content, it can also be used in fish farms.

Generally, most traditional water treatment solutions have been bulky and require space. In order to address this issue, some enterprises have developed lightweight and modular solutions. For example, Grey Water (Jaldhara Technologies Pvt. Ltd.) manufactures decentralized and fully automatic sewage treatment systems which purify and recirculate water for cleaning homes, heating/cooling, and flushing. Their systems require minimum installation work and are plug-and-play solutions. Additionally, they have fewer moving parts than conventional systems, thus creating no noise.

Industrial wastewater treatment

Social enterprises help small-scale industries meet their environment compliance requirements by providing technologies and consultancy services to minimize sludge formation and meet zero liquid discharge goals. Sludge obtained after wastewater treatment has high water content. Since the cost of sludge disposal is determined by weight, and water is heavy, dewatering sludge is crucial for industries. Some enterprises have developed unique technologies to increase the efficiency of sludge dewatering. Bridgedots, an Indian waste management enterprise, has developed a water repellent (hydrophobic) coating for polypropylene and cotton bags used in sludge dewatering. The water repellent coating makes the dewatering process efficient.

Since industries produce different effluents, some enterprises focus on a particular industry for wastewater treatment. For example, Synergy Waste Management, an enterprise in India, provides treatment of effluent water generated during treatment of bio-medical waste and reuse of treated water for plantation and cleaning purposes. It provides collection and transportation facilities too. Synergy provides centralized treatment facilities to municipal corporations and decentralized treatment solutions to medical institutes, hospitals, nursing homes, laboratories, blood banks, and diagnostic centers.

Figure 25. Wastewater treatment, design to collection to disposal/reuse

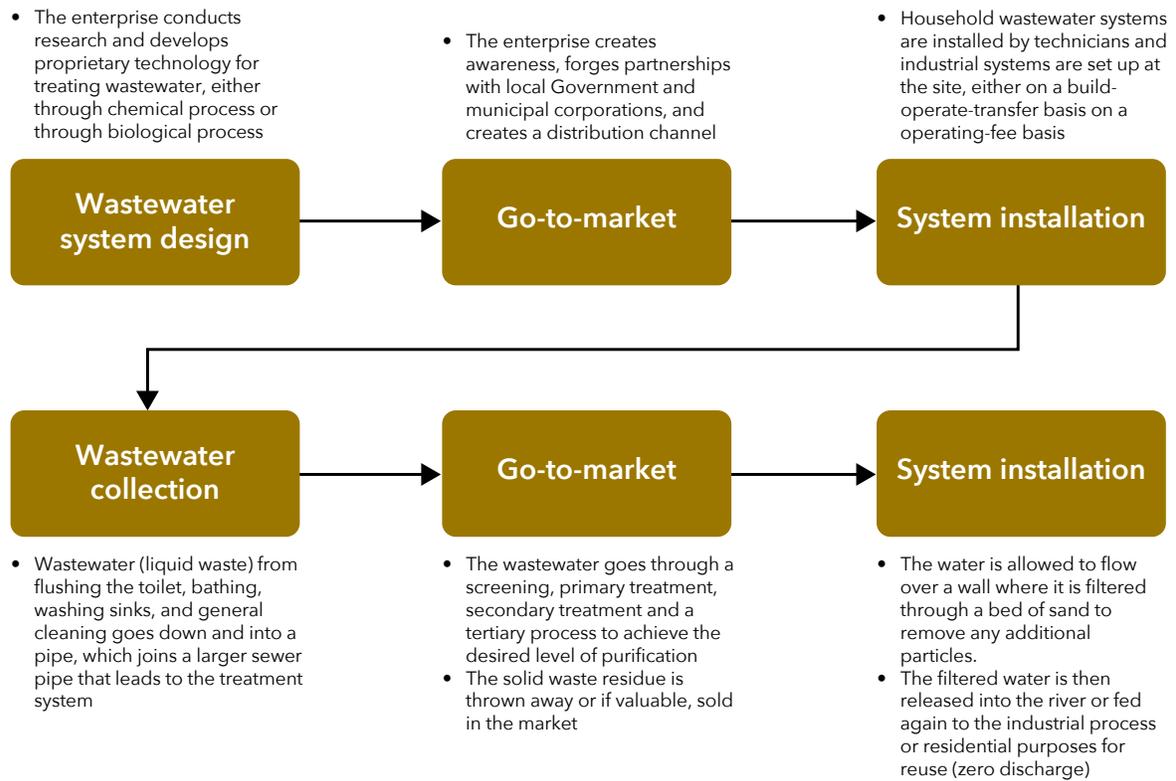


Table 35. Costs and components

Type	Cost components
Capital costs*	Civil construction: 25-40 percent Equipment supply and installation: 20-30 percent Auxiliary buildings: 10-20 percent Contractor's overhead: 10-20 percent
Operating costs**	Electricity fee: 27 percent Water discharge fee: 18 percent Staff cost: 18 percent Sludge transport and disposal: 13 percent Maintenance and replacement cost: 10 percent Administration and marketing cost: 9 percent Chemical fee: 6 percent

* Primary interviews.

** CostWater 2017.

Cost Factors

The capital costs of wastewater treatment plants include civil construction, equipment supply and installation, auxiliary buildings, and contractors' overheads. Running costs of wastewater treatment plants mainly include wastewater discharge fee, electricity cost, chemical cost, staff cost, maintenance and replacement cost, sludge disposal, administration cost. Waste water plants incur high electricity costs (CostWater 2017). The proportion of these components in total cost varies in different plants. Generally, the monthly cost per m³ of water treated is USD 0.11 (CostWater 2017). In India, if an industry has to manage a sewage plant which cleans 60 million liters of water daily, the annual cost is around USD 0.55 million (Modi 2013).

The most important factors impacting the costs of a household water treatment plant are:

- 1) **Consumer awareness:** Lack of consumer awareness may lead to high marketing costs
- 2) **Market size:** Willingness or ability to invest in a long-term wastewater management solution is an important cost consideration for enterprises while designing their systems
- 3) **Locally sourced materials:** Some filters and membranes may be expensive to obtain and manufacturing cost may be higher due to import of such material

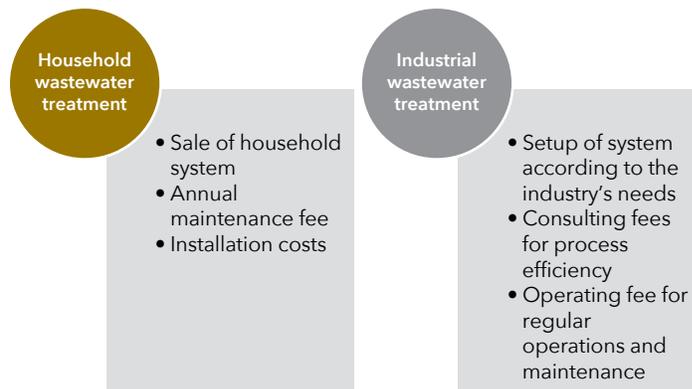
The most important factors impacting the costs of an industrial water treatment plant are (CCC 2013):

- 1) **Economies of scale:** The cost per liter of wastewater processed generally goes down as the capacity goes up.
- 2) **Density of Development:** Densely developed areas are the most cost effective as collection costs are minimized due to shorter sewer length.
- 3) **Land costs:** Suitable land is scarce and expensive. If a treatment plant occupies less space, the costs could be considerably lower.

Revenue Streams

The major revenue streams for household wastewater treatment systems are from sale of the product, annual maintenance fee and installation charges. For industrial wastewater systems, major revenue streams include price of system setup, consulting fees and operating fees. Industrial wastewater treatment enterprises generally either just design and build the systems for municipalities and large processing plants, or manage the complete end-to-end installation and operations. The revenues for enterprises that adopt a build-operate-transfer (BOT) approach come largely from the initial setup fees and these revenues are not recurring from one plant. Most industrial treatment plants are presently BOT-based and prefer to take up projects initiated by the Government or funded by multilateral agencies. In India, a majority of the water-related projects are being executed for government bodies with financial support from the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), Japan International Cooperation Agency, Asian Development Bank and the World Bank.

Figure 26. Household versus industrial wastewater treatment



Hence revenue and cash flows have been reasonable. Revenues from the private sector (large processing industries) are still limited.

In India, a typical household water treatment plant is priced at about USD 500 (INR 30,000) (Syal 2013). The pricing of household wastewater systems is still quite high and hence, unaffordable for individual households. Most decentralized systems are currently community-based and serve several households or are installed in gated communities or societies. This reduces the price per household to some extent. However, increasingly new technologies that automate certain processes and use less energy are emerging in the market. These systems are priced low and targeted at low-income households in vulnerable communities. For example, Wetlands Work! in Cambodia treats waste water using biological technology that requires minimal operational cost and can serve the floating households of poor people in Cambodia at a scale.

Financial Viability

The wastewater treatment market in developing countries such as India is highly fragmented. Enterprises compete on the basis of cost, technical expertise, experience and brand equity. For large municipal and industrial projects there is a pre-bidding process, and hence expertise and past experience with credible or well-known clients are critical factors. Enterprises that offer energy-efficient solutions at competitive costs are likely to find a larger slice of the wastewater treatment market.

Industrial wastewater treatment plants have a breakeven period between 3–8 years, due to the high capital costs. Profitability depends on whether the treated water is reused by the industry, thus reducing dependence on ‘new’ water. The average margins in this industry depends on the country, grants and customer base, but generally varies from 10 to 35 percent (Agua Inc. 2017). To streamline costs, companies like VA Tech Wabag in India have built captive power plants which utilize the sewage to produce energy. The green energy generated from such projects is also eligible for carbon credits. Triveni Engineering, another company in the wastewater sector, builds and operates sewage treatment in municipalities and desalination projects, and sells the treated water to industries. Hence, it has an additional revenue

stream that helps in covering wastewater operating costs and achieving higher profitability. Business models like these can make large-scale wastewater management projects viable.

For domestic wastewater treatment plants, the customer base presently is small as there is limited awareness and willingness to install a system within homes or work premises. Many environment-conscious residential apartments and housing societies have begun to accept and adopt these wastewater treatment plants that also reduce their costs of managing sewage. Wastewater treatment enterprises are partnering with large developers and builders to install systems in metropolitan cities.

Partnerships

Wastewater enterprises working in low-income communities generally work closely with corporates, educational institutions, government, NGOs and other waste sector stakeholders. Their objectives for partnership include product development, awareness creation, or creation of marketing and distribution channels. For example, Ecosoftt works with Gram Vikas, World Toilet Organization, and Environmental & Water Technology Centre of Innovation, Singapore. It also works with Autodesk as a CleanTech partner. Ecosoftt also received a grant from Design Singapore Council to advance the design of a unique product within its Water SMART Homes & Communities platform.

Many international organizations and Governments of developed countries have also started programs to support innovative enterprises in developing countries that are scalable and have the potential to make a significant impact in the waste sector. Waste enterprises participate in these programs to develop their technologies and manage initial costs. For example, Wetlands Work!, an enterprise in Cambodia, has partnered with multiple stakeholders to develop its products. It received financial support of USD 100,000 from the Bill and Melinda Gates Foundation to develop a proof-of-concept for a floating community sanitation solution called HandyPod. WW! is also a part of Sustainable Sanitation Alliance (SuSanA). WW! is active in the Water and Sanitation cohort in the Ministry of Rural Development of Cambodia which has partnered with the World Bank Water and Sanitation Program. Other WW! partners include Save the Children, a (World Bank funded) Early Childhood Development program in floating communities, local NGOs supported by UNICEF for floating school sanitation, and People in Need and other organizations for flood prone sanitation. Support for the present sanitation marketing scale up of the HandyPod comes from a grant to WaterAid Cambodia from Canada's Grand Challenges for Global Health Fund, for which WW! has partnered with WaterAid. Conservation International and Engineers Without Borders have also supported WW!.

Implementation: Delivering Value to the Poor

Awareness

Wastewater treatment enterprises have dedicated staff to reach out to residential communities and industries to explain their treatment process and the potential benefits. Some

enterprises conduct roadshows in rural areas on the harmful effects of untreated wastewater, while some industrial wastewater system manufacturers approach industry associations to reach out to network processing companies for sourcing customers. Other enterprises spread awareness about general hygiene and environment protection in local schools and communities. For example, Ecosoftt runs a program called AQUA that embeds concepts of water, wastewater and environment protection into the curriculum of schools, colleges and institutes for higher learning. Ecosoftt has developed a set of curricula and learning paths to enable students of various age groups to become aware of water and environmental issues. Ecosoftt also has an initiative called Solutions for Underprivileged Lives (SOUL), which is a community-led transformation program that ensures that underserved and marginalized communities can obtain access to clean water, recycling and reuse of wastewater, basic sanitation facilities, and improved livelihood opportunities. Through this program, it raises issues related to health risks from untreated wastewater, encouraging many of the community members to sign up for its systems.

Acceptance

To improve acceptance of wastewater treatment systems, enterprises provide a range of sizes of the system to apply to different quantities of waste. These solutions fit specific needs and are scalable to cater to future requirement. They also offer speedy installation to gain acceptance among the households. For example, Vision Earthcare, an enterprise in India, produces systems that can be customized to residential client requirements. In the system, the sewage water is passed through the specialized media and as the water is filtered down through it, the sewage is converted into potable water within four hours. The technology is referred to as soil biotechnology. This reduces overall water consumption by 40–45 percent. These improvements make the wastewater systems more readily accepted by non-commercial clients.

Industrial wastewater treatment enterprises that offer end-to-end waste management solutions find ready acceptance. For example, Bridgedots in India has a specialized R&D team, which develops technology solutions for waste treatment that not only help in removal of hazards from waste, but also in waste utilization. It develops waste treatment technology for extraction of valuable components from the waste and removal of hazardous material from the waste*. Bridgedots helps its clients to comply with industry regulations and environmental specifications of waste water management. It develops innovative solutions for capacity increment and technology upgrade, and recovery of useful materials from sludge. It also conducts water audits for its clients in collaboration with expert professors and consultants.

* Industrial effluent contains various contaminants such as feedstock materials, byproducts, product residues, washing/cleaning agents, solvents, and other functional products like plasticizers

Accessibility

Many communities do not have regular access to clean water. However, last-mile delivery and service is not always commercially feasible for water treatment enterprises. Some enterprises have, therefore, started a franchise model in which the reseller is also one of the beneficiaries. For example, Saha Global, a non-profit enterprise in Northern Ghana, trains local women to be water entrepreneurs in communities that lack clean water. The women fetch water from their local surface water source to fill three 200-liter drums. They use alum to remove the particles from the water, leaving it clear. This clear water is moved to a polytank where it is treated with chlorine. Saha Global Field Representatives distribute Safe Storage Containers to every family in the community. These 20-liter buckets have a lid and a tap, which helps to prevent water re-contamination in the home. One Safe Storage Container provides enough drinking water for 2–5 days depending on the size of the family.

Affordability

In water-stressed rural regions, standard waste water treatment plants for potable and drinking purposes are prohibitively expensive. A localized solution at the community level through which the consumers can also contribute towards water purification is more affordable and sustainable. For example, Saha Global does not drill wells or use imported pumps that often break down. All of the water is transported by hand from the dugout, treated by hand in the village and then carried home by the consumer. 100 percent of the revenue from the water businesses stays within the community and is managed by the women entrepreneurs, and is used to cover the cost of the water treatment materials and to compensate the entrepreneurs for their work. The women sell the clean drinking water to their community for a small fee. The community works with the women to determine an affordable price.

For water polluting industries and processing plants, affordability is countered by their need to adhere to a government mandate. Further, if they can reuse water, they perceive added cost savings.

Results and Cost-Effectiveness

Scale and Reach

Treatment of wastewater is often driven by government mandate (industrial users), and the desire to save the environment and reduce dependence on municipal fresh water (for residential users). Hence, enterprises catering to industrial users find it easier to scale faster by focusing on industries that produce significant wastewater. Enterprises catering to residences, schools, and apartment blocks may find it more difficult to convince target customers of the cost effectiveness of their solutions.

Industries generate different types of waste depending on the chemical processes they employ. Generally, wastewater systems are built to focus on one or a few of these pro-

cesses. An industrial wastewater management manufacturer may therefore be restricted in its ability to treat different contaminants, as it may have the IP and technical expertise only for a particular treatment process suited only to one sector. This may in turn restrict its scalability and expansion to other industries. As a business model, wastewater treatment systems are quite scalable geographically. This is because the process is standardized and easy to replicate. Manufacturing can also be centralized with a franchise model for marketing and selling.

Enterprises with treatment systems that have a flexible capacity find it easier to scale. For example, in Haiti non-profit organizations Engineers Without Borders and Partners in Health teamed up to install a 30 x 45 m² wastewater treatment facility in a hospital with a donation-based budget of less than USD 250,000. The system can accommodate a flow rate of more than 300 m³ per day of cholera-infected waste. It is scalable according to the needs of the hospital and can handle fluctuating flow rates. It can be installed in less than a day and can be operated without technical expertise as well. Such systems are replicable and can reach all those areas that have poor wastewater treatment infrastructure.

Table 36. Scale at which some wastewater enterprises operate

Type	Years	Scale
Saha Global	8	Launched 93 clean water businesses
Triveni	32	1000 industrial units of average capacity 30 MLD* installed
SFC	13	30 industrial units of average capacity 40 MLD installed
PT. Tirtakreasi Amrita	26	200 plants built of average capacity 0.3 MLD

* MLD refers to million liters of wastewater treated per day

Improving Outcomes

Wastewater treatment enterprises produce outcomes that are beneficial not only to the consumer, but also to the society at large. Wastewater treatment reduces the amount of waste released into the environment, and has an impact on health risks associated with environmental pollution. It also reduces the freshwater loss induced through water pollution. Wastewater treatment reduces the amount of money spent by a country on environmental rehabilitation projects required to battle pollution. Household wastewater systems can help in recycling wastewater for reuse. For example, Ecosoft's Water SMART Homes & Communities platform allows water sustainability through a 3-pronged approach: reduce water footprint and wastage by up to 50 percent, recycle and reuse up to 80 percent of wastewater for non-potable purposes; and discharge the balance 20 percent in an environmentally friendly way. Ecosoft also has a product called Sulabh Waste-to-Energy, which brings the double benefit of reducing sludge from the wastewater treatment process while producing biogas beneficial to the community.

Waste water enterprises catering to industrial customers also help them meet environmental norms. For example, PT. Tirtakreasi Amrita in Indonesia has a concept of integrated waste management with zero discharge that reduces Green House Gases (GHG) and enables its clients to generate Certified Emission Reductions (CERs).[†] Some enterprises enable livelihoods generation along with sustainable access to treated water in local communities. In 7 years, Saha Global has provided jobs to 178 women entrepreneurs in northern Ghana. Most of the women are farmers who sell safe water to ear additional income. For a family living on less than USD 2 each day, the money the women earn from the water treatment business is significant and is invested in children's health and education.

Cost-Effectiveness

The technology used by wastewater treatment enterprises has a significant bearing on the cost-effectiveness of their business model. For example, Vision Earth Care's treatment plants use a novel high-efficiency natural oxidation process to replace the use of heavy blowers for oxidation in conventional technologies. The plants are built to be easy to run with virtually no maintenance, reducing operational & maintenance cost by 60 percent from the operating cost of a conventional sewage treatment plant. Similarly, Agua Inc., Kenya, has devised an innovative way of treating industrial waste water using floating green filters, a biological water treatment method that uses a combination of hardware and macrophyte phytoremediation plants, a species of aquatic plants.[‡] This biological mechanism reduces the prohibitive costs associated with waste water treatment.

Some enterprises provide advanced wastewater treatment systems that make on-site treatment of wastewater within homes and residential communities highly effective compared to other systems. For example, Ecosoftt has systems such as Aerobic Biofilters Without Sludge (ABWS) that consumes 70 percent less energy than conventional activated sludge systems. It is also compatible with solar energy and incurs low installation and maintenance costs. Additionally, consumers can produce rich organic fertilizer as by-product which can be revenue-generating. Similarly, Greywater Tech (Jaldhara) manufactures and sells both household and industrial wastewater systems that are 20–50 percent smaller than conventional systems, require no on-site fabrication, and have very little operating costs in terms of electricity and monitoring.

Many enterprises have developed affordable solutions to not only treat polluted water, but also produce by-products that can be sold or used to cover the cost of the water treatment. For example, AcuaCare, a household waste treatment enterprise in Colombia, packages worms, microbes and enzymes into biodegradable, cardboard-box "treatment systems" which purifies water through a process called vermifiltration.[§] A USD 170,000 AcuaCare

[†] Based on Kyoto Protocol (1990) the industrial countries can take credit of CERs from developing countries issued by the Executive Board. The Clean Development Mechanism (CDM) in developing countries such as Indonesia, Brazil, China, India etc, which aims to reduce carbon emission, helps the industries in industrial countries (EU, Japan, Canada, etc.) to fulfill their carbon limit by buying CERs from the developing countries.

[‡] The ability of macrophytes to hyper-accumulate heavy metals makes them a natural waste water purification method, especially for the treatment of industrial effluents and sewage wastewater.

[§] A cheaper alternative to septic tanks. Unlike traditional septic tanks that simply filter feces from the water, leaving toxic sludge for later disposal.

installation for 1,000 people produces 32 tons of organic fertilizer annually, worth about USD 12,000 in Colombia (Cala 2015). Every year, the system also yields 3 tons of excess earthworms that can be used to make animal feed, worth about USD 7,200. These products are in addition to a steady supply of water for crops, gardens or public spaces, which would cost about USD 25,000 a year from the local municipal water system. With proper maintenance, an AcuaCare system lasts for 15 years and breakeven is estimated to reach in 4 years.[¶] AcuaCare also uses 80 percent less energy and has operating costs 70 percent lower than conventional water filtration—particularly by decreasing water use.

There are innovations in industrial wastewater treatment too that reduce costs and make the treatment process cheaper than conventional systems. For example, SFC India has come up with Cyclic activated sludge technology (C-Tech) for biological treatment of all effluents that makes sludge treatment highly cost-efficient. C-Tech consumes 50 percent less power and 50 percent less land area compared to other traditional technologies. It also requires less costly material,^{**} is also fully automatic and does not require constant operator attention. The treated sewage/effluent can be used for horticulture, green belt development, and industrial applications like cooling tower.

Scaling Up

Challenges

The major challenges for the water treatment sector include technical barriers, sub-optimal markets for recovered nutrients, lack of awareness of the economic value of water, lack of resources for full-scale implementation and validation of innovative solutions, and lack of knowledge with regard to the occurrence of emerging pollutants. Wastewater plant operators also have trouble maintaining complicated systems while keeping costs low. In their innovation journey, enterprises often face a challenge after they develop a prototype, due to lack of financial resources for further development, customization, demonstration and commercialization. There is a lack of demonstration sites for new technologies to customers due to the capital-intensive nature of such large-scale demonstration in relation to their perceived economic value. Also, the cost of certifying multiple products in multiple countries is prohibitive, resulting ultimately in a limitation of technologies to only few large scale processes per country that justify the approval cost. This ultimately leads to adoption of sub-optimal technologies.

Energy consumption is one of the largest expenses in operating a wastewater treatment plant. In municipal wastewater treatment, the largest proportion of energy is used in biological treatment, generally in the range of 50–60 percent of plant usage (Oxymem 2017). Another challenge for industrial wastewater treatment is the requirement for land to construct the plants. Activated sludge plants are expensive to construct and occupy substantial land areas. Primary and Secondary processes rely upon vast tracts of land for large and expensive settling tanks and aeration basins. These processes may not be economically

[¶] The expenses include: a) personnel (USD 25,000); b) materials and equipment (USD 20,000); and c) domestic travel for wastewater sample collection (USD 5,000).

^{**} It uses all underwater metal parts in stainless steel, resulting in higher plant life and low maintenance costs.

viable for all industries and hence lead to lower adoption. Newer technologies are aiming to reduce the space and capital outlay required to achieve the same level of treatment through alternative processes.

Role of Government and Policy

National Governments of various developing countries have strengthened water quality standards and are progressively limiting wastewater discharges. For these reasons, most countries recognize that industrial wastewater treatment provides a substantial public good, and national budget funds subsidize at least a part of local wastewater treatment. Given the low level of demand for wastewater services, especially treatment, government regulation becomes an important factor in fostering that demand. Regulation (imposing standards on wastewater discharges by both industry and local government) has been critical in fostering compliance. Enforceable regulation has been found to be critical in allowing economic incentives to work.

For residential communities, treatment is usually the responsibility of agencies that also provide piped drinking water. These agencies may be municipalities, county Governments, or separate special-purpose authorities. User charges for wastewater are generally tied to piped water consumption, at least for those users that discharge into publicly provided sewage systems. However, since user fees alone are generally insufficient to repay capital costs, social enterprises are developing innovative technologies for decentralized treatment of wastewater at the household level and working with the local Government to sell them.

In recent decades, compliance with Government wastewater quality requirements has been the primary driver of industrial wastewater treatment programs in developing countries. Most Governments mandate wastewater treatment for industries. Industries are supposed to abide by the Government wastewater quality requirements for the specific concentration limits of the wastewater discharged. The regulations governing the recovery of wastewater, however, vary across countries. Some Governments actually authorize the use of treated wastewater to irrigate crops or water green spaces. Since this is an added cost for the processing industries, governments often provide incentives such as tax credits or rebates.

Government regulations in most countries usually rely on the recommendations of the World Health Organization (WHO). In India, for example, the Zero Liquid Discharge (ZLD) or Zero Discharge (ZD) Policy has been drafted by the Ministry of Environment and Forest (MoEF) and Central Pollution Control Board (CPCB). Currently, only a few states and specific industrial end users like textile and automobile manufacturers and breweries are mandated to achieve ZLD status. It is expected to be implemented uniformly all over the country in the coming years. In Malawi, the Government the requirement to treat wastewater is underscored by the existing regulatory framework, institutional arrangements, and policy guidelines. One of the specific goals in the National Water Policy (NWP) (Malawi Government, 2005) is to ensure water of acceptable quality for all needs in Malawi. In addition, formalized national effluent standards exist in Malawi (Malawi Bureau of Standards, 2005). In Indonesia, the Central Government has adopted a national policy to promote private sector participation in BOT projects for tourist hotels and water supply source works. The Government is also aiming to solidify the regulatory environment and develop

mechanisms whereby local water authorities can enter into joint ventures and enforceable contractual arrangements with the private sector.

Governments also support research and development of innovative and cost effective technologies to treat waste water for reuse. The Centre for Science and Environment has proposed to set up India's first referral laboratory for fecal waste to support planning, design and implementation of effective fecal waste management systems and mainstreaming decentralized wastewater treatment. The National Urban Sanitation Policy (NUSP), 2008, endorses reuse of reclaimed water, and recommends a minimum of 20 percent reuse of wastewater in every city. In the last few years, the Government of India has taken many concrete steps to promote reuse of wastewater. It began with regulating industrial water consumption and enforcing mandatory water reuse targets for industries.

Most governments, however, face significant challenges in enforcing laws and implementing their plans to recycle and reuse wastewater. Governance of the water sector is characterized by complicated regulatory responsibility across political hierarchy levels that result in fragmentation (e.g. different regulations and standards per region). Although wastewater reuse is endorsed in many policies and programs, there is a lack of clear guidelines and frameworks to support the implementation of such projects. As a result, the reuse of reclaimed water for non-potable purposes continues to face challenges. The problem is further exacerbated by limited enforcement of the restriction to extract groundwater for non-potable purposes.

While financial support of international organizations and developed countries is essential, it is imperative that local conditions are considered to make full use of any aid. The adoption of inappropriate technology and failure to take into consideration the local conditions of the targeted community result in project failure that is often blamed on the lack of technical know-how. In addition, government support is needed for environmental education and public awareness and participation.

Conclusion

While the wastewater treatment industry is growing rapidly, there continues to be a huge gap between wastewater generation and treatment. Although the potential market for water treatment enterprises is fairly large, demand for water treatment and management is driven primarily by stringent government policies prescribing and mandating wastewater treatment. Other factor such as increasing industrialization, demand for freshwater and increasing urbanization in emerging markets of Asia Pacific and Latin America will also drive water and wastewater treatment demand.

While the market for household wastewater systems is less developed, increasing environmental concerns and irregular water supply are driving the growth of systems that not only treat waste water but also enable its reuse. Wastewater treatment enterprises operate in a push market, where they are also tasked with market creation. They face a capital crunch from the initial research and development phase to commercialization. This is not helped by the unit economics of the model, where individual plants are expensive.

Government assistance, financial and regulatory, as well as support from development financial institutions is needed to boost this business model. As treatment processes become

Table 37. Social enterprises: Wastewater treatment

<i>Company</i>	<i>Country</i>	<i>Solution description</i>
AcuaCare	Colombia	The technology used by AcuaCare allows biological treatment of wastewater using earthworms and microorganisms which transforms the pollution in the water into organic fertilizer and allows the reuse of the treated water for irrigation. www.ozy.com/rising-stars/juan-carlos-guqueta-the-colombian-worm-king/60199
Agua Inc	Gambia, Dominican Republic, Mali, Spain, Kenya, Haiti	Agua Inc. has devised an innovative way of treating industrial waste water using floating green filters, a biological water treatment method that uses a combination of hardware and macrophyte phytoremediation plants, a species of aquatic plants. aguainc.com
Bridgedots TechServices	India, Europe, Middle East, USA and Australia	Bridgedots provides services related to industrial solid waste and wastewater treatment. www.bridgedots.com
Ecosoftt	Singapore, India, Hong Kong	Ecosoftt's Solutions for Underprivileged Lives (SOUL) programme is a community led transformation program that ensures underserved and marginalized communities can obtain access to clean water, recycling and reuse of wastewater, basic sanitation facilities, and improved livelihood opportunities. ecosoftt.org
Greenenvironment Innovation and Marketing	India	Greenenvironment undertakes fresh water and recycled water management contracts in urban apartment complexes. Greenenvironment monitors real-time water and wastewater treatment systems in apartment complexes helping them significantly reduce their water consumption. greenenvironmentindia.com/
Grey Water (Jaldhara Technologies Pvt. Ltd.)	India	Grey Water offers a unique range of highly compact, plug and play, modular waste water treatment and water recycling products for residential and commercial buildings, hospitality and industrial sectors. www.greywatertech.com
PT. Tirtakreasi Amrita	Indonesia, Sri Lanka, Nepal, Vietnam and Nigeria	PT. Tirtakreasi Amrita makes treatment plants ranging from drinking water, sewage treatment, to complex industrial effluent treatment plant for various industries. www.amritaenvironmental.com
Saha Global	Ghana	Saha Global empowers women in rural communities to solve their village's need for clean water and electricity by providing business opportunities. sahaglobal.org
SFC India	India	SFC supplies Cyclic Activated Sludge Technology (C Tech), an advanced sequential batch reactor technology. This technology is extensively used for treating domestic sewage and industrial effluents. The treated sewage from C Tech plants can be recycled for industrial applications, gardening, agriculture and other applications. www.ctechsbr.com/home.php
SKS Infrastructure	India	At SKS, waste water treatment initiatives are geared at treating the organic, inorganic and heavy metal contaminants in waste water (sewage and effluent) to facilitate re-usability in centralized as well as decentralized manner. sksinfrastructure.com

Table 37. Social enterprises: Wastewater treatment (continued)

<i>Company</i>	<i>Country</i>	<i>Solution description</i>
Synergy Energy Limited	India	Synergy provides integrated bio-medical waste management services. It collects bio-medical waste through its Common Bio-Medical Waste Treatment Facilities (CBWTF) that caters to a number of health care establishments. It then disinfects and treats the waste through incineration, autoclave and shredding. www.synergyworld.co.in/index.html
Triveni Engineering & Industries Ltd	India	TEIL's Water Business Group (WBG) offer products and services that cover the entire spectrum of water treatment desalination, waste water treatment and recycle for industries, infrastructure and municipal projects. www.trivenigroup.com/water-solution-microsite.html
Vision Earthcare	India	Vision Earthcare provides effective eco-friendly solutions to water treatment across all scales. Its services include design and turnkey execution of soil biotechnology. www.visionearthcare.com
Wetlands Work!	Cambodia	Wetlands Work! is a social enterprise that designs and builds innovative constructed wetland systems to treat various contaminated waters, to allow reuse or safe release into the environment. wetlandswork.com

more cost-effective, the adoption of the wastewater systems by both residential and industrial consumers is bound to increase rapidly.

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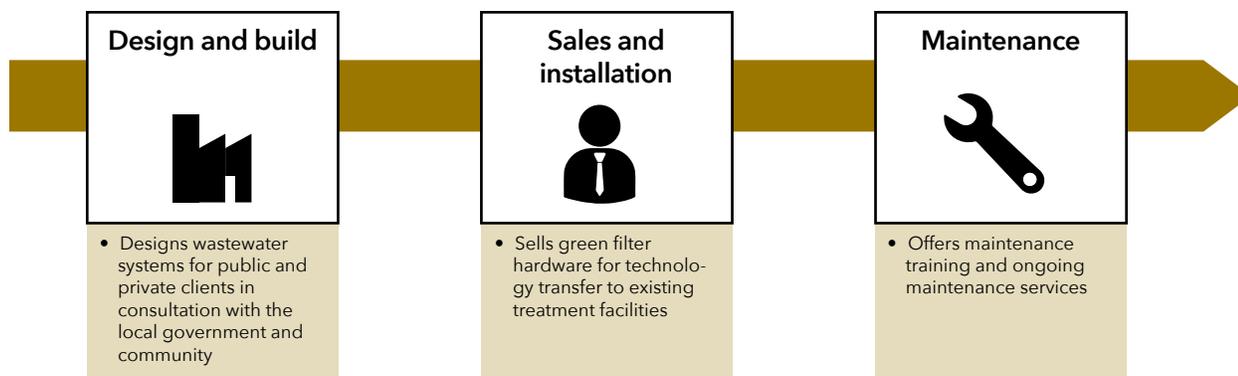
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	<p>PROFILE</p> <h2>Agua Inc Global Development Group</h2>
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<p>Founding year: 2013 HQ: Colorado, USA Countries of operation: Gambia, Dominican Republic, Mali, Spain, Kenya, Haiti</p>	<p>Orientation: For-profit Employees: 40 Turnover: USD 1–2 million</p>
<p>Typical water treatment technologies entail very high costs, complex maintenance, and environmental impacts. Agua Inc. is an innovative water and wastewater treatment technology company and facility developer, that provides cost-effective and energy-efficient solutions for municipalities around the world. It transforms the unit economics of wastewater treatment by building facilities that are 50 percent less expensive to construct and operate, making wastewater treatment more profitable.</p> <p>Its proprietary technology system naturally cleans contaminated water sources and wastewater more effectively, more sustainably, and more affordably than traditional treatment technologies. The firm uses its ABIS (Aquatic Biological Integrated Systems) water treatment method that filters water through matrices of floating plants.</p>	

Operating Model

Nearly 90 percent of wastewater in emerging markets remains untreated when discharged, resulting in surface water contamination and the rapid growth of dead zones in rivers and oceans (UNEP and ISWA 2015). This also has health implications for surrounding communities as at least 1.8 million children under five years old die every year from water related diseases. In emerging markets, unsafe water is the number one cause of disease and death in these communities. However, most conventional approaches require large



quantities of reliable energy supply and chemicals which are simply not available in most developing countries.

Agua Inc., a biological wastewater treatment enterprise has devised an innovative water treatment method which filters water through matrices of floating plants. Agua uses a combination of specialized plants (PhytoTech), hardware (BioHardware), and filter materials (BioFilters) to naturally and effectively treat water for a variety of applications (wastewater treatment and recycling, drinking water purification, etc). Additionally, the ability of macrophytes to hyper-accumulate heavy metals makes them a natural wastewater treatment method for industrial effluents. Agua systems replace conventional machines with its innovative and affordable treatment method called ABIS (Aquatic Biological Integrated Systems), which achieves similar treatment processes with biological methods.

Agua Inc's team has experience participating in over 200 projects until date. Today, its target market includes wastewater treatment plant facilities, local and international governments, international development organizations, private investors, corporate social responsibility arms, NGOs, and national utility regulators. It engages the local community to understand their needs and designs the system accordingly. One of the ways in which it does local outreach is sponsoring local football teams. Agua is also a partner in the Global Wastewater Initiative (GW2I), a multi-stakeholder platform to initiate comprehensive, effective and sustained programmes addressing wastewater management.

Agua undertakes both new builds and upgrades to existing facilities. In upgrade projects, Agua sells green filter hardware, as well as specially bred phytoremediation plants, to existing water treatment systems. In new build projects, Agua works with municipal corporations to provide customized turnkey wastewater treatment facilities that are fully constructed and ready to operate. After the completion of the project, it hands over the operations of the facility to the client and offers maintenance training and on-going maintenance services.

In addition to building new facilities and maintaining them for clients, Agua offers a Utility Development Program, where the enterprise takes over wastewater treatment system development and operations from city municipalities. Based on a comprehensive analysis of the municipality's system, Agua's engineering team designs a customized upgrade plan for the system. It signs a concessionary agreement which gives Agua the right to operate the facility and provide wastewater treatment services to its users. Agua works with its network of private and institutional investors to raise the appropriate funds to pay for the upgrade.

Agua Inc assumes operations of the facility and appropriate upgrades are installed. It continues to operate the facility ensuring quality service provision to all users. Under this model, revenue is generated by charging either the appropriate utility or government counterpart for service provision and allowing them to charge end users, or charging consumers directly.

Financial Sustainability

Agua incurs major costs on maintenance of the plant, leasing and the pipe networks, and it generates revenues from design-and-build projects and Concessionary/Build-Operate-Transfer deals (upgrading and operating wastewater treatment facility as a service). Agua's systems are generally designed to be energy efficient and chemical free. As a result, the enterprise is able to save on electricity (making up over 25 percent of average facility operating costs) and chemicals (25 percent of operating expenses) as compared to traditional wastewater systems.

Most wastewater treatment facilities generally require Government subsidies to meet the gap between income generated from operations, and the costs of development and on-going operations. Agua has implemented a unique financing method to make the project cost-effective, wherein the Government gives Agua a concession—a lease to lands and lagoons. The enterprise then brings private investors to upgrade the system and the public pays the same price preset by the Government, but to Agua instead of the municipal corporation. Through significant cost savings in operations and revenue collection optimization processes, Agua delivers improved treatment at a reduced cost. This results in reduced subsidies, and in many cases a fully financially sustainable business.

Impact

Agua's waste water treatment system has the ability to buffer highly polluted effluent, allowing for effective long-term treatment. Besides, the system eliminates odors and improves the sites natural aesthetics. It is highly adaptable and can eliminate pathogens, fecal matter, heavy metals and contaminants from various water sources without chemicals and minimal energy use. The system does not require much specialized technical expertise and can be locally run creating direct employment and indirect income generating opportunities from water related activities. Additionally, it also generates clean water for reuse in agriculture and industry and restoration of waterways and aquifers. This biological mechanism reduces the prohibitive costs associated with wastewater treatment. Agua also creates impact by spreading awareness about vaccination and gives health insurance to all its employees

Challenges and Lessons

The ABIS technology by Agua can be applied to a wide range of water treatment applications; however, it faces some operating constraints, for example ABIS is not normally recommended for highly saline wastewaters. Additionally, ABIS is most appropriate for warm to

temperate climates, and is not suited to far northern environments with harsh winters unless a greenhouse is constructed. Agua also depends completely on local municipal corporations as its clients and winning the tender and executing a contract is a tedious process for it. Agua Inc is also facing some financing constraints and is looking to raise external funds.

Road Ahead

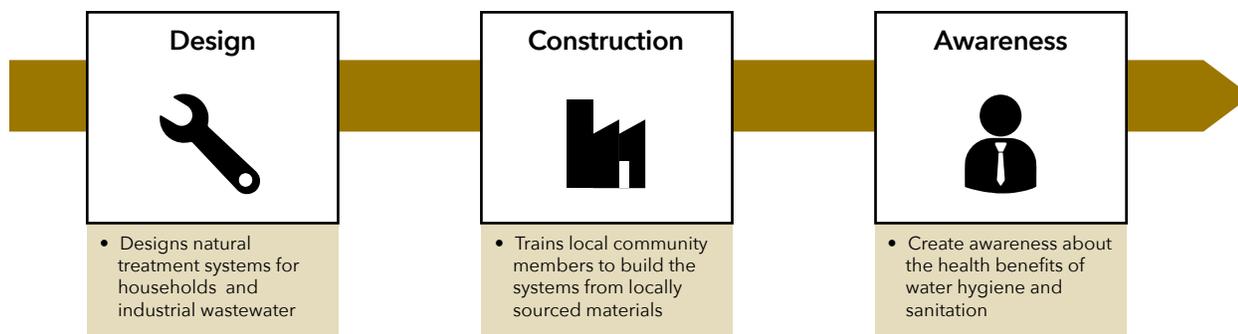
Agua aims to not only make water and wastewater treatment more sustainable and more affordable, but ultimately transform a generally subsidized industry into one that can improve environmental and public health, while providing good jobs and maintaining financial viability. By making the offering of these basic services financially sustainable, the company's objective is to catalyze increased investment in infrastructure to close the water and sanitation development gaps that still remain prevalent in emerging markets.

	<p>PROFILE</p> <h2>Wetlands Work!</h2>
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<p>Founding year: 2011 HQ: Cambodia Countries of operation: Cambodia</p>	<p>Orientation: For-profit Employees: 8 Turnover: Pre-turnover</p>
<p>People living in the floating villages of Tonle Sap Lake in Cambodia suffer from health issues often related to poor sanitation and water contamination. Social enterprise Wetlands Work! in Cambodia designs practical solutions to treat polluted water. It specializes in innovative wetland water systems and its latest project, HandyPod, in being implemented in Cambodia as an appropriate solutions for floating community sanitation. It also offers consulting services to build and implement low-cost technical designs. It can address a variety of wastewater types, and have unique and practical treatment systems for sanitation in floating communities as well as for households in flood-prone environments.</p>	

Operating Model

Globally, poor sanitation and contaminated industrial effluents exacerbate child mortality and human health, decrease the availability and access to safe water for consumption, food-related uses, and washing, and degrade vital habitats. Millions of people worldwide face annual or episodic flood events which co-mingle waste waters from many sources, leading to significant health issues for populations over large geographic areas. Wetlands Work! (WW!) is a social enterprise in Cambodia that has developed innovative solutions for sanitation in flood-prone environments and other contexts. It designs and builds constructed wetland systems to treat various contaminated waters, to allow reuse or safe release into the environment. One of the designs is a three stage treatment system for flood-resilient sanitation for populations living in such extreme environments. The system significantly improves



upon current practices in excreta disposal and management in seasonally high groundwater table areas, as well.

Wetlands Work! in Cambodia designs practical solutions to treat polluted water. It specializes in selling low-cost innovative wetland water systems to low-income communities living in flood-prone areas of Cambodia. It also offers consulting services to build and implement low cost technical designs. It can address a variety of wastewater types, and have unique and practical treatment systems for sanitation in floating communities as well as for households in flood prone environments.

In nature, wetland and floodplain plants help to remove contaminants from water, while at the same time supporting a variety of species including fish, birds, mammals, amphibians, insects and aquatic invertebrates and microbes. Wetlands can be created to convert contaminated water into potable water. Wetlands Work! designs ecologically engineered water treatment processes to transform domestic sewage and other waste streams into improved water. It uses common wetland plant species to provide an active root surface area, attached to which are trillions of microbes that break down waste into food usable by numerous other organisms in the system. Thus, Wetlands Work! designs can be applied to communities in need of sustainable, low-cost access to improved water.

The water produced from constructed wetlands can be recycled for reuse, and can even be treated further to meet WHO drinking water standards. Some of WW!'s models can be used in off-the-grid rural areas, including those where poor, marginalized people live. At the household level, a simple WW! system can be set up in several days, using inexpensive, locally available materials. For larger systems, WW! takes around a month to construct and install the system.

WW! is part of Sustainable Sanitation Alliance (SuSanA). WW! is active in the Water and Sanitation cohort in the Ministry of Rural Development of Cambodia which has partnered with the World Bank Water and Sanitation Program. Other WW! partners include Save the Children, a (World Bank funded) Early Childhood Development program in floating communities, local NGOs supported by UNICEF for floating school sanitation, and People in Need and other organizations for flood prone sanitation. Support for the present sanitation marketing scale up of the HandyPod comes from a grant to WaterAid Cambodia from Canada's Grand Challenges for Global Health Fund, for which WW! has partnered with WaterAid. Conservation International and Engineers Without Borders have also supported WW!.

Wetlands Work! partners with local community groups to train them to install the systems. In sanitation for challenging environments, WW! works in 10 communities and 2000 households across 10 villages. It has numerous potential commercial customers in industries such as garments and silk textiles. Wetlands Work! has piloted wastewater treatment design for 49 land-based flood prone households that sit in risky floodwater for up to 6 months of the year. Wetlands Work!'s other projects include treatment designs for contaminated industrial wastewaters, residences and hotels, zoo animal enclosures, and even water treatment for natural swimming pools that do not use chlorine.

Financial Sustainability

Wetlands Work! incurs major costs on research, design, and testing of various systems, which includes staff time, materials needed for building prototypes, analyses to gauge performance of the systems, and overhead costs. The focus of the design phase is to build a system at a low cost, by using locally available, natural materials as much as possible, and to ensure that maintenance is minimal. The major revenue streams for Wetlands Work! so far have been grants for testing and piloting of the designs, and consulting fees for design and implementation of the systems. Wetlands Work collaborates with local businesses to supply, sell and install the HandyPods. It aims to develop solutions that can be supplied by local businesses in a sustained fashion. Instead of giving the systems away for free using donor funding, WW! creates and implements programs to engage local entrepreneurs in a sanitation marketing approach. It also generates demand for its product by the families in the villages using the Community Led Total Sanitation (CLTS) process, and engaging children in the communities by installing systems in schools and carrying out sanitation awareness campaigns.

The HandyPod is a low maintenance technology for households in floating communities made up of about USD 140 worth of labor and materials and priced at around USD 180. The system is expected to last 5–10 years, with some repair of the frame performed as needed, similar to what residents of floating households are accustomed to doing with their dwellings. The targets of the HandyPod scale up project are residents of floating communities as well as small business entrepreneurs who will make and market quality HandyPods. The unit economics of making the water system affordable to this very poor population still remains a key challenge. To address this, WW! provides consumer financing through a community loan service.

Impact

Wetland-based treatment systems create a more visually appealing environment by eliminating the appearance of floating solid waste, mitigating odors and, most importantly, lowering health risks to resulting from contact of sewage contaminated water.

With the implementation of Wetlands Work!, there is increased dignity for users and improved health in the floating communities, most of whom rely on fishing as a source of income. The HandyPod provides convenience to families, eliminating the need for long boat

journeys out of the village in search of a private place to defecate. WW! has also developed educational programming for schools and community buildings on the importance sanitation and hygiene.

Challenges and Lessons

Wetlands Work! has faced challenges in raising capital for expansion. To tackle this issue, it has hired more part-time staff, who are paid less than their full-time peers. Rather than relying heavily on grant funding for its non-profit systems, such as those for households in challenging environments, WW! is seeking to develop and promote its for-profit systems, such as those for industrial effluents, more strongly. . An additional challenge has been in having the status of a for-profit social enterprise rather than an NGO, which can in some cases result in it being ineligible for certain funding sources.

Road Ahead

Many large cities in India, Africa and Asia are estimated to explode with rural migration over the next decade due to population growth, jobs, changing climate issues of drought and flood, and exhausted non-productive rural landscapes. These poor landless migrants will have only the most marginal land and water areas to live. Wetlands Work!'s flood-prone and HandyPod technologies will serve as templates to address such large-scale 'safe water' problems. When girls begin menstruation, they may stop going to school because the school does not have appropriate sanitation facilities. WW! aims to solve this issue and provide the schools with sanitation systems.

Wetlands Work! is looking to expand in SE Asia to Myanmar, Indonesia, Malaysia and the Philippines, as well as other flood prone regions such as Bangladesh. It will apply for the Phase II grant from the Canadian Government's Grand Challenges for another 24 months to scale up its sanitation marketing process and geographical expansion. Wetlands Work! has been a semi-finalist for several health and innovation awards including the Reed-Elsevier Environmental Challenge, the Suez Environment Institute de France, and the Civil Society Innovation WASH (Australia) awards and will apply to similar recognition programs in the future.

STRATEGIES TO
REACH THE POOR



STRATEGIES TO REACH THE POOR

Creating Consumer Awareness for Products or Services

Solutions for developing a business model when a product or service type is not known or habitually consumed by low income customers

HIGHLIGHTS

- Despite clear health or long-term benefits, it can be challenging and costly to build demand and create new habits around buying and using a product or service among low-income consumers.
- Inclusive business models have used various approaches in awareness raising education, aspirational marketing, bundling, influential peer recommendations, initial subsidies, and demonstrations.
- Given the social externalities, governments can play an active in awareness activities.



Stoves, toilets, financial services, and health services all benefit consumers but may not actually be in demand amongst the target segment. These are markets where the potential customers of a product or service can be completely unfamiliar with this product* or any other similar product, and do not have the habit of using it in their daily routines. As a result, active market demand is minimal.

Many such products improve health, education, living standards, and wellbeing of low-income households. But simply making the product impactful, available, and affordable is not enough to achieve sales. With low demand, there is little chance of creating a sustainable self-financing value chain, or of addressing development challenges at scale.

Successful business models in these markets use a range of solutions to make low-income consumers aware of the benefits of such a product before they can begin to make sales, and

* In this document from here on the term 'product' can apply to both a product or a service for low-income customers

to incentivize them to become familiar with the product. These approaches take into account that acceptance of the product is achieved when consumers have made adjustments to their lives to make regular use of the product, so that buying and using the product becomes habitual. Examples include educational initiatives, recommendations from influential individuals, making the product aspirational, demonstrations, bundling with more familiar products, and subsidies.

Challenges

A conventional definition of a consumer market (Simanis 2010) is that there is a common understanding among a group of consumers:

- About *how a product or service is used*, to the extent that it is a normal part of people's lives, and that they have developed a habit of both purchasing and also of using a product regularly
- That a product or service is *worth paying for* because it has a value to the consumer

Without these two elements in place a consumer market does not truly exist, and this is the most significant problem that enterprises innovating new models in such contexts have to address.

A first step to building demand is to understand needs. Outsiders can have perceptions about what low-income people need that can differ to what they actually want (Harrison and Huda 2013). Before seeking to develop the market for a new product, it is essential to consult with low-income people as to what their needs and wants are.

Raising awareness of the products and their benefits is the next challenge. Potential customers will be unfamiliar with the value proposition that this product offers because they may have had no exposure to the product or even the type of product. Once a low-income consumer is aware of a product, a decision needs to be made by the consumer that such a product is sufficiently beneficial to them to prioritize purchasing it instead of using this money for another purchase or activity. They also need to build use of the product into their daily routines such that buying and using the product becomes a habit.

High cost of raising awareness

Raising awareness is a key challenge for many inclusive business initiatives, especially for consumer products where margins are low because they are predicated on reaching high volumes quickly to reduce unit costs. Erik Simanis from the Center for Sustainable Enterprise at Cornell University's Johnson School of Management has had exposure to several examples of this and suggests that:

Consumers at the bottom of the pyramid lack what anthropologists call a “cultural competence” for product consumption—they aren’t accustomed to using and experimenting with products. The adoption of new products entails a steep learning curve for them. Consequently, sales and marketing efforts involve deploying a substantial number of people with sales skills and deep product knowledge—an expensive proposition. (Simanis 2012)

Sectors where awareness is the primary challenge

Lack of awareness and demand is a major factor in markets for products such as fortified food, home solar products, insurance, many sanitation products and some health services. This paper focuses on the markets listed, but the problems are long-standing and familiar to other players who seek to promote, for example, uptake of improved seed or bed nets. The slow uptake of bed nets treated with insecticide can also be ascribed to the time it takes for consumers to develop the habit of using bed nets when houses are not designed to accommodate them, and of then learning the importance of using and re-treating the bed net regularly (Heierli and Lengeler 2008).

Effective awareness building is insufficient on its own

Raising awareness and building acceptance are just part of delivering a value proposition to the BoP—affordability and availability must be addressed too. Acceptance is to some extent part of the awareness challenge because consumers must accept that a product is useful to them before they can build the habit of using a product. There is a strong overlap between building awareness and development of distribution when addressing availability. Recent innovations in rural distribution models have expanded the role of distribution and the distribution partners respectively. The distributor role is no longer restricted to physical distribution of products and services alone, but may also include elements of awareness raising about new categories of products, and provision of several other inputs which influence a consumer’s purchase decision, such as credit and post-sales service. The challenge of affordability is also one that has to be overcome once a consumer is aware of, and accepts, a product, but making a product affordable will not in itself overcome the challenge of lack of awareness.

Innovative Approaches

Rarely will one solution on its own address the challenge of awareness creation, but there are some common approaches that occur in various combinations (see table 39).

Table 38. Some common approaches used for addressing challenges in consumer awareness

<i>Approaches to raising awareness</i>	<i>Summary of the approach</i>
Educating consumers	The product is supported by education. This can be done by a public authority, non-profit, or community body, but from a business perspective a sales force can also undertake education as part of their marketing strategy.
Recommendation from influential individuals	Trusted members of the community such as health workers, or more affluent households that are looked up to, are engaged to explain and demonstrate the product (or service).
Making the product aspirational	Sometimes linked to influential individuals, this solution is more explicitly about creating an aspiration that will drive demand for the product. The product is marketed as a lifestyle choice not a necessity for the poor.
Demonstration and experiencing the product	Examples of the product are provided free or at subsidized cost so that consumers can see the product being used by others and/or experience the benefits themselves.
Bundling with more familiar products	The product is included with other complementary products that consumers are already familiar with and therefore get to experience the new product.
Initial subsidy	The product is heavily subsidized so that there are incentives for enterprises to invest in raising awareness until there is a demand for it.

Educating consumers

Educating potential consumers on the benefits of using a product is a common approach in markets where awareness is a major challenge. This can be embedded within the activities of a sales force directly, in which case it may be referred to as high-touch marketing. This is done by companies selling stoves, solar systems and other energy products, fortified food and nutritional products, toilets and other products and services in the water and sanitation sector. A local and engaged salesforce is essential. Alternatively, non-governmental organization (NGO) partners, community groups and government bodies run education campaigns. These focus on the product category not the specific brand.

Recommendation from influential individuals

Influential individuals in the community can have a significant role in raising awareness of products and making them aspirational for the rest of the community. This is particularly important where adoption requires a significant change in attitudes, as is the case with adoption of toilets. It is widely acknowledged that word of mouth recommendations are extremely influential on the purchasing decisions of low-income consumers (Hystra 2013). Early adopters influence their neighbors. As product penetration rises, assuming quality is high, word-of-mouth marketing can supplant some of the more intensive initial activation.

Example: Raising awareness of modern energy products

The benefits of products such as solar lighting and improved cook stoves are unknown to households that have only ever accessed solid fuel or kerosene and are not familiar with making a larger purchase in order to save money later. For example, solar home systems can save considerable household expenditure over a year compared to expenditure on kerosene while also reducing indoor air pollution, but a major challenge is making consumers aware of the many benefits of using such products compared to traditional methods.

In order to sell solar devices to poor families, enterprises have had to develop sales and distribution models that brought their sales force into close contact with customers in order for them to be able to explain the benefits of using solar power against more traditional options that the consumers were more familiar with. Because these sales usually require micro-credit this has made the value proposition even more difficult to communicate and made education an essential part of the marketing process.

Businesses selling solar home products such as Grameen Shakti, Sunlabob and ONergy create awareness of their products through local sales agents. Grameen Shakti, for example, trained over 1,200 local agents to go from door to door and demonstrate the effectiveness of these products.

To drive home the benefits of using the new product, and as part of a strategy to encourage habitual use of such a product, some enterprises are encouraging households to put aside the savings that they accrue over their purchases in respect to lighting (Hystra 2013).

Example: Raising awareness of nutritional products

There are certain micro-nutrients that are essential for development in the first two years of life. A mother in a rural area will not be aware that the traditional food combinations, based on crops grown by her family, are unlikely to contain these micro-nutrients in sufficient quantities. Complementary foods and food supplements that are fortified with micro-nutrients are therefore beneficial products to procure to supplement the child's diet but face a huge task of building awareness and adoption.

For example, in Madagascar there is a fortified porridge product branded as Koba Aina marketed by Nutri'zaza. In order to grow sales, the enterprise needs to educate people who raise their children on a diet of breast feeding and rice that after a certain age these do not cover the nutritional needs of infants. Some infant food is sold directly door-to-door to embed education on the product. In another example, Danone Milkkuat "strong milk" fortified milk in Indonesia employs sales ladies who also provide advice on nutrition to mothers.

The approach can be driven by focusing on changing the behavior of influential individuals. WaterSHED, an NGO in Cambodia that was spun out of a donor project, acts as market facilitator for rural toilets. In its business model, local chiefs have significant influence on consumer demand in target areas and hence are core stakeholders for demand creation and outreach.

mHealth is a tool to make health services more efficient and effective, improving the health outcomes for any person with access to a mobile device. But potential beneficiaries of this service may be unaware of the diseases themselves, and unaware of the mHealth option. Enterprises introducing mHealth business models use health care providers or trusted health workers in a community to make the patients aware of the applications available.

Making the product aspirational

The approach outlined above is also often linked to a focus on messages that resonate with consumers' aspiration. Convenience, privacy, and safety of women and children are the primary reasons for toilet demand for example, whereas health benefits are not a major driver. This informs the marketing messages for toilets. The Selling Sanitation program in Kenya positions products as aspirational, with a zero-subsidy policy. The main adoption triggers focus on social status.

Strategies such as Community-Led Total Sanitation (CLTS), an innovative methodology for mobilizing communities to completely eliminate open defecation (Community Led Total Sanitation. n.d.), or UNICEF India's 'take the poo to the loo' campaign, focus on changing attitudes (UNCF 2017). These strategies recognize that providing toilets does not guarantee their use, nor result in improved sanitation and hygiene. By raising awareness that as long as even a minority continues to defecate in the open everyone is at risk of disease, the approaches create a community-wide desire for collective change, and thereby drives demand for low-cost toilets, among other solutions.

Demonstration and experiencing the product

Allowing people to see the product in use and experience it for themselves is a powerful way to raise awareness of a new type of product.

Enterprises that are selling solar products, for example, often give away samples of their product to allow potential customers to see them in action. Placing demonstration models of solar home systems in schools or community centers contributes to spreading the knowledge and illustrating the benefits.

ONergy in India is a social enterprise that is setting up a sales network for a variety of renewable solutions for domestic energy needs (World Bank 2017). The enterprise has established Renewable Energy Centers where people are trained to become micro entrepreneurs to then mentor other users. These centers are also sales points and locations for public demonstrations. Grameen Shakti also installs systems in public places for free to raise awareness.

Bundling with more familiar products

Bundling the new product along with a number of more familiar products is an innovative way of making consumers aware of a product. By 'practicing' how to use the product, and seeing benefits, this also builds acceptance of the product and customers building it into their daily lives and routines.

Naya Jeevan is an enterprise pioneering micro health insurance in Pakistan. Low-income people are almost completely un-served with health insurance, despite this being an affordable way for them to smooth over financial shocks occurring when they incur out of pocket medical expenses. The Naya Jeevan business model involves bundling insurance plans with high value health services designed to meet the needs of low-income markets. They also

partner with large multinationals such as Unilever to provide health insurance to their informal and formal employees as a precondition for doing business with the company. Similarly, mHealth enterprises will sometimes engage their mobile service providers to push the mHealth solution to its subscribers bundled with other apps and services.

Initial subsidy

Product subsidy is sometimes part of an approach to improve awareness at the BoP. Targeted subsidies reduce the initial cost of a product, therefore reducing the risk to consumers or entrepreneurs where the value proposition of the purchase is not yet clearly established in their minds.

For example, in sanitation projects, targeted subsidies to reduce the price to low-income households are often part of the business model. For rural toilet business models, market activation interventions are typically grant-financed and are initiated based on the assumption that once the value chain is ‘activated’, the market facilitator can stop interventions after a set period of time (usually some years).

Other emerging approaches

Companies, NGOs and/or governments can collaborate to raise awareness and build acceptance of new products. For example, the Global Alliance for Improved Nutrition (GAIN) is an alliance that utilizes public-private partnerships to increase access to nutrients that are missing from some low-income people’s diets (GAIN 2017).

There are some fast moving consumer goods such as home cleaning products or chemical insect repellents that a low income group may be totally unfamiliar with. An approach to building familiarity and habitual use has been successfully trialed that involves socializing the products through user-groups or ‘clubs’ so that members of the club are enabled to experiment with the product in collaboration with other users with the guidance of a company representative. The new consumers thereby grow accustomed to using it and develop their own habits for including it into their daily routines (Simanis and Duke 2014).

Text messages can be used to reinforce the habit of making use of a product that requires regular use, such as when a course of medicine has been prescribed. Texting is also used by enterprises to follow up sales calls in order to reinforce messages and encourage re-purchase of a product (Hystra 2013).

Progress

There are some markets where, over time and with significant investment and donor support, awareness of the benefits of products and consumer habits of using them has been achieved. Some pioneer enterprises selling home solar products, for example, have been operating for more than 20 years now. The biggest player in the market, Grameen Shakti (World Bank

2017) has reached around 8 million people in Bangladesh by installing over 1.5 million units. Many other businesses reach between 100,000 and one million people and many enterprises that operate with a for-profit business model are financially viable businesses.

In other markets with significant awareness challenges, some uptake in scale is being seen, but not yet delivery of positive financial results. For example in the market for food fortified with micro-nutrients, some good results are being achieved in sales. In South Africa and Zimbabwe, E'pap, a fortified porridge sells one million units per month. Nutri'Zaza has an impact on 25,000 children (ages 6–24 months) today and is expected to reach 200,000 by 2016. However there is less evidence of financial return on investment. Models may generate significant revenues (for example USD 234,000 for Nutri'zaza and USD 3.3 million for Grameen Danone for 2014) but not yet achieve financial sustainability.

For some of the other examples outlined in this paper a lot more investment is needed in awareness raising of products and measures to support consumers to embed them into their lives. Most micro-insurance schemes have not scaled up significantly. Enterprises selling rural toilets are also struggling to reach financial viability, and where they are, the model is not reaching the poorest households.

Constraints and Drivers for Growth and Scale

Drivers for entering markets where consumer awareness is a challenge:

The *commercial drivers* are to find a new market that no one else is addressing and therefore avoid competition. This new market would also mean that the potential market size in terms of consumer numbers is very high. However as noted above the risks and costs attached to this are considerable. The *social driver* for enterprises is seeking to introduce an innovation that will create a completely new option for low-income people to address their basic needs. Markets where product awareness is low are often ones where the development need is extensive, such as health and nutrition, or there is another agenda important to the enterprise such as reducing the environmental consequences of burning fossil fuels or wood.

Constraints to achieving progress and support available to address constraints:

Because of the slow uptake of products in such markets the low margin/high volume model that many consumer goods companies adopt may not work. This would push the company to a higher margin model, a consumer market which already has awareness, or failure to scale. The cost and time of raising awareness is a critical constraint.

In some markets a variety of funding sources are available to help enterprises to address these constraints. For example, there are carbon credits for products using low-carbon technologies and impact investment where social returns are more important than financial ones to help social enterprise to address the constraints in this market. One rationale for grant funding to early stage businesses in early stage markets is that creation of awareness of a product type is a public good, which cannot be done solely by individual firms. Access to these sources of funding may help an enterprise to achieve financial sustainability once

demand for a product has been established. This could be one reason why emerging social enterprises that can more readily access grants or soft capital are making more progress than large companies with inclusive business ventures for whom awareness is a significant issue (Ashley and Sivakumaran 2014).

Roles and Implications for Government

Table 39 outlines some examples of how government can support the approaches that are adopted by enterprises in markets where consumer awareness is low.

Table 39. Role of government addressing challenges in consumer awareness

<i>Approaches to raising awareness</i>	<i>Role of government</i>
Educating consumers	<p>Governments have a major role in educating people about their health and nutritional needs, including the role that safe water and adequate sanitation play in good health.</p> <p>In sanitation markets such as rural toilets, government has an overall facilitation role in the market. This can include the funding of awareness creation and demand generation, such as funding education activities for key individuals e.g., health officers.</p>
Influential individuals	<p>As noted in the 'solutions' section, elected leaders and traditional chiefs are influential people that can usefully be involved in a variety of business models to raise awareness of new products.</p>
Demonstration and experiencing the product	<p>Governments can contribute through public procurement of assets that demonstrate their use for the rest of the community. For example, Governments may act as product promoters for productive energy sources by buying innovative green applications for their own facilities, such as water pumping stations.</p>
Bundling with more familiar products	<p>Government will not have a role in this approach in many business models as bundling refers to the sale of products, however one exception to this is provided in the micro health insurance market. In India for example, the Insurance and Regulatory Development Authority introduced a "forced familiarity" policy mandating all general insurers to have at least seven percent of their policies over the rural sector in order to accelerate the development of business models for the rural markets.</p>
Initial subsidy	<p>Subsidies are a useful tool for governments in many areas, and can provide incentives for enterprises and individual to address low awareness of new products. For example, targeted subsidies to low-income households to reduce the price of toilets can drive adoption of improved sanitation (Arnold et al. 2014). The potential distortion effects of such subsidies can be minimized by allowing a choice of provider and by ensuring that the subsidy does not distort the efficient operation of the value chain.</p> <p>Similarly, for solar home solutions some governments support enterprises raising awareness of these solutions, and driving the uptake and acceptance of rural electrification. This is done through subsidies on solar PV, zero-rated import duties or removed value added tax on renewable energy. In Bangladesh, the price of the system impacted household decision making - a 10 percent decline in the price of the system increased the overall demand for a solar panel by 2 percent.</p> <p>A problem to consider is how to wean consumers or producers from government subsidies once they are accustomed to having them, and how— in scaling up—the subsidies can be financed and sustained where necessary.</p>

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STRATEGIES TO REACH THE POOR

Managing Last-Mile Distribution to Low-Income Consumers

Distribution models that reach low-income consumers in remote areas need to consider innovative, cost-effective, local solutions

HIGHLIGHTS

- Distributing products and services cost-effectively in remote and hard-to-reach areas is a key challenge to serving to low income consumers.
- Inclusive businesses use different approaches to cover the last mile, such as village-level entrepreneurs and local sales agents, piggybacking on existing networks of partner organizations, and upgrading existing retail networks.



Summary

One of the distinctive challenges of Bottom of the Pyramid (BoP) markets is the logistics of reaching low-income customers. Whether the product is a solar home system, a toilet, a low-cost school, or a health clinic, the entrepreneur faces the question of how to get the product to the consumer, or the consumer to the service, without incurring such huge costs that the initiative is not viable.

BoP consumers are hard to reach for many reasons, and not just because of their low-spending power. Markets are fragmented and thin, with few players. Conventional low-cost distribution options, such as large central stores, are irrelevant. BoP consumers lack transport to travel far, and taking goods and services* to them can be expensive (for distant rural areas) or impractical with usual means (trucks cannot travel far in informal

* In this document the term 'product' or 'good' can apply to both a product or a service for low-income customers.

settlements). Purchase may depend on high-touch marketing and demonstration by people they trust, people like them. Many businesses have tackled the challenge of covering the last mile in recent years and a number of solutions are being used, including local sales agents and piggybacking on existing networks that reach the BoP.

Challenges

Innovative products and services designed to meet the specific needs of low-income customers and underserved markets will only be successful if they reach end-consumers. Setting up distribution systems to reach poor consumers who often live in areas with weak infrastructure is costly and challenging and often not part of a companies' core expertise. Enterprises across Asia, Africa and Latin America consider weak distribution channels to low-income consumers as a significant barrier to growth (Koh et al. 2014).

There are different types of challenges that companies have to address (Business Innovation Facility 2013):

- *Absence of conventional distribution chain:* Markets often lack the presence of distributors and distribution infrastructure such as warehouses, cold storage, logistics and transport infrastructure, and retail outlets. Narrow and/or poor quality roads are not able to accommodate standard delivery vehicles and retail shops not big enough to take on lots of additional inventory.
- *Fragmented and decentralized demand:* Consumer groups in these markets are heterogeneous. Demand is also fairly decentralized, in that there are no mechanisms to aggregate demand from many small customers (no equivalent to the superstore or online outlet) across regions and segments. There are cultures where it is also difficult for people (mainly women) to leave the home or village in order to procure goods and services that they need.
- *Reverse logistics are crucial but difficult:* After-sales support is crucial for durables (e.g. water filters, pumps, solar home lighting kits, etc.) that tend to be costly purchases. However, it is challenging for manufacturers to provide product training, servicing and part replacement services in remote geographies.
- *Irregular and unreliable cash flows:* Consumers are usually cash-poor and cash flows depend on external factors such as weather and harvest cycles. Consumers are unable to make single large payments and require financing assistance. This is a particular challenge faced by distributors of durable goods and means that distribution also needs to be combined with availability of end-consumer financing.
- *Demand for basic services is latent:* While there is a clear need for basic services (water, sanitation, health, education and energy), it does not translate into demand. Converting this latent demand into real demand requires building in mechanisms such as awareness-building programs and free product trials into the distribution chain and often adapting the roles of sales and distribution staff.

- *Demand is fairly elastic:* Cash-poor consumers are price-sensitive yet highly cautious to compromise on quality. This means that increased end-consumer prices to cover costs of decentralized distribution is not possible. At the same time, cutting costs through lower quality also does not work. Hence, efficiencies in distribution systems are needed.

Businesses need to find cost-effective distribution methods that are suited to the nature of the market, local infrastructure availability and other challenges described above. The ‘last mile distribution challenge’ is not exclusive to a particular sector, but different types of products will face different challenges and distribution systems need to be adapted accordingly.

Distribution is insufficient on its own

This report covers key issues relating to making products available to end-consumers. However, distribution of any product or service requires careful consideration of consumer awareness, acceptance and affordability, too. In fact, recent innovations in rural distribution models have expanded the role of distribution and the distribution partners respectively. The distributor role is no longer restricted to physical distribution of products and services alone, but also covers provision of several other inputs, which influence a consumer’s purchase decision, such as credit and post-sales service (Shukla and Bairiganjan 2011).

Innovative Approaches

Table 40 summarizes some distribution approaches that are used across sectors. Each model is explained in further detail below.

Table 40. Summary of innovative approaches to last mile distribution

<i>Model</i>	<i>Detail</i>	<i>Example</i>
Village Level Entrepreneurs	Identification of leaders and entrepreneurs in the community to play the role of sales agents, working as micro-entrepreneurs or franchisees.	<ul style="list-style-type: none"> • JITA’s consumer goods venture in Bangladesh, with 4,000 women distributors (‘aparajitas’) selling door-to-door in rural areas and earning USD 12–38 per month.* • The Healthstore Foundation’s network of 48 basic medical clinics in Kenya owned and operated by franchisee nurses.**
Proprietary distribution	Manufacturer/producer owns all or most intermediary levels to the end-consumer, e.g. distribution via company’s own branch or outlet run by employees.	<ul style="list-style-type: none"> • Solar Now’s branch distribution of solar home systems in East Africa via their own network of sales employees. • Oando’s sales of low-cost gas cooking stoves and provision of cylinder refill in Nigeria via the companies’ gas stations.

Table 40. Summary of innovative approaches to last mile distribution (continued)

<i>Model</i>	<i>Detail</i>	<i>Example</i>
Piggyback on networks of partner organizations	Establishment of hybrid partnerships with MFIs, NGOs, self-help groups, ^{***} government networks, cooperatives that are well established in the local scene and can provide a direct network of targeted communities.	<ul style="list-style-type: none"> • Hindustan Unilever’s partnership with MFIs in India for distribution of their low-cost water filters. • d.light’s engagement with savings groups in Northern Kenya for the distribution of solar products.
Enter and upgrade existing retail networks	Leveraging existing retail channels. Upgrading local value chains, integrating new products in traditional production and sales channels rather than building separate retail chains.	<ul style="list-style-type: none"> • Hapinoy’s work with 3,000 Sari-Sari stores in the Philippines supporting them to offer higher value products and services in their existing stores.^{****} • Selling Sanitation Program working with national plastic manufacturers in Kenya on development and distribution of affordable sanitation products.

* JITA, n.d.

** CFW Clinics, n.d.

*** A Self-Help Group (SHG) is a group of micro-entrepreneurs, typically 10-15 local women, with similar social-economic backgrounds, who voluntarily come together to save regular small amounts of money individually, while also contributing to a common corpus to meet their emergency needs on the basis of mutual understanding.

**** Hapinoy, n.d.

Rarely will one solution on its own address the challenge of last mile distribution. Companies often adopt multi-channel strategies. For instance, Project Dharma is a social enterprise, which aims to serve the needs of rural households at the BoP by creating a rural retail network providing products and services sold at an affordable price point. The company’s distribution model includes direct sales via Village Level Entrepreneurs (VLEs) recruited and trained by Project Dharma, distribution partnership with MFIs, NGOs, and dairy cooperatives, as well as distribution through existing village retailers. Products currently offered include solar lighting, smokeless cook-stoves, water purifiers and nutritional drinks, mostly manufactured by large multinational corporations (MNCs).

Village-Level Entrepreneurs

Also known as a rural or micro entrepreneur, a village-level entrepreneur (VLE) is an individual selected from within a village who acts as a “touch point” between a business and local customers for a certain set of products and services. The company supplies the product or service being sold and provides additional support to help the VLE succeed. Typically, the VLE sells the company’s product, provides customer support, invests capital, earns commission, and takes risks. A VLE’s role is important for sales, product promotion, product selection, field testing and trials, as well as after-sales servicing. For the relationship between a company and VLE to work, the potential risks and rewards must be aligned for both stakeholders and, as table 41 shows, different VLE models are suitable for different contexts (Business Innovation Facility 2012). Finding the right model depends on a number

Table 41. Classification of VLE Models based on consumer demand and financial risk

<i>VLE model</i>	<i>Example</i>
<i>Pure Play VLE:</i> the VLE is responsible for all capital expenditure and working capital, the risk lies with the VLE. This model is useful if there is high-market demand and low upfront investment required for the VLE.	Project Shakti was launched by Hindustan Unilever (HUL) in 2001. HUL sells fast moving consumer goods (FMCG) to the rural populations through women VLEs known as “Shakti Ammas” The project is designed to help these women set up a direct-to-consumer retail business.
<i>Hybrid VLE:</i> ‘Employee model’ where the company is responsible for capital investment and pays the VLE a base salary in addition to commission. This model is useful if there is low market demand and high market investment required.	BASIX, is a leading microfinance institution in India. The VLE division of Basix focuses on the government’s CSC (Common Service Centers) program and employs local youths (VLEs) to run the kiosks on a fixed salary and commission.
<i>Quasi VLE:</i> The company is responsible for all capital investment. This model is useful if there is moderate to high market demand and high upfront investment required.	ITC, an Indian multi-business conglomerate, established the e-Choupal as a platform to connect with the rural farmers via the internet. The VLE or “Sanchalak” acts as an interface between ITC and the local farmers. The VLEs role is to aggregate produce demand for agricultural inputs and consumer goods, and he earns a commission for his services from ITC.

of factors, particularly strengths of pre-existing consumer demand, and level of financial risk for the VLE.

Some VLE models, in particular for complex products or services, are set up as franchise relationships. For example, Husk Power Systems has used a “micro-franchising model” to supply equipment and training to local entrepreneurs to set up and operate village power-systems in India. Similarly, Sanergy in Kenya is working with entrepreneurs operating their mobile fresh life toilets under a franchise agreement.

The VLE model seems a very attractive model and is being used by many organizations successfully. However, some key success factors should be noted:

- **Sales force retention:** Providing competitive compensation is a necessary condition for keeping churn below manageable levels. When compensation is sufficiently attractive, churn can be reduced to a manageable 30 percent, even with purely variable commission-based incentives. For products requiring customization (and thus a long lead-time, discouraging a sales force on commission only), providing a fixed compensation is key for sales force retention (Hystra 2013).
- **Customer retention:** Due to relatively high costs of customer acquisition, channel ‘loyalty’ is a key success factor. Customer retention drives repeat or follow-on sales. Factors such as agent selection, training, motivation, continuity and status have an impact on customer retention.[†]

[†] The Global Social Benefit Institute (GSBI®) serves social entrepreneurs around the world who are developing innovative solutions that provide a sustainable path out of poverty.

Proprietary distribution

In the case of proprietary distribution, the supplier owns all or most intermediary levels of the distribution chain. This model offers the opportunity to develop an independent, ‘in-house’ go-to-market capacity without involvement of existing market players. The supplier sells directly to customers, sets up a distribution system via the company’s own branch or outlet run by employees, or employed sales agents. The advantages of this approach include high control, low risk, opportunity for branding, ongoing customer engagement, and the opportunity to create competitive barriers to entry in niche markets. Sales of new products can be easily piloted before offering the product to external distributor networks. Various companies in the energy sector adopt this model, such as Solar Now in Africa and Orb Energy in India selling solar home systems. Effective distribution and ongoing service and maintenance are integral to the success or failure of a business model in the off-grid energy sector. Branch distribution provides high control/low risk and enables a direct relationship with the end-consumer before and after sales.

Examples exist in other sectors too. Table 42 provides examples for innovative last mile product and service delivery in health and education.

One of the main challenges of this model are the prohibitive costs related to channel development, staff, control, monitoring and management. Proprietary distribution is an expensive pursuit unless developed for funneling a suite of complementary products so that overhead costs are spread across a wide revenue base (Shukla and Bairiganjan 2011).

Piggyback on networks of partner organizations

This distribution model is based on partnerships with NGOs, micro-finance institutions (MFIs), cooperatives or government networks that are well established in local contexts, can provide a direct network of targeted communities and often have valuable knowledge of the market.

Table 42. Last mile product and service delivery in health and education

<i>Organization</i>	<i>Example</i>
Vision Spring	Vision Spring is a social enterprise selling affordable eyewear. It employs a retail component to its business in India through both stand-alone optical shops and shops located within partner hospitals and surgical centers. These optical shops serve BoP customers by providing eye tests and selling affordable prescription, reading and sunglasses.
Agastya Foundation	Agastya Foundation operates mobile labs (mini vans carrying hands-on science models) that visit rural schools in several Indian states several times a year to make interactive learning accessible to rural communities.
SevaMob	SevaMob provides services to low-income consumers in India through a subscription-based model in which doctors visit patients’ homes on a monthly basis for regular checkups.

Typically network partners play one of four roles:

- 1) Extend reach and penetration via their existing networks and unlock new markets
- 2) Make the product more saleable via bundling or awareness building
- 3) Finance the consumer's purchase where needed
- 4) Add trust and brand value to the product through their relationship with consumers
(Business Innovation Facility 2013)

Different partnerships provide different advantages. For example, MFIs can offer financing but are unlikely to engage in extensive marketing activities or after-sales servicing. NGOs are likely to have good networks and sales can be integrated into existing awareness raising campaigns, but alternative financing options are required. Table 43 provides examples of different types of distribution partnerships.

Piggybacking offers high potential for cost-savings because the product distributor does not need to create a new network and brand. However, it demands effort to find and create a partnership that works, and distribution will be limited by the partner's mandate and reach. MFIs, for example, have good reach in some areas, but limited geographic coverage to the BoP and have restricted mandates for promotion of consumer durables. Aspects like 'partner fit' and alignment of interests and incentives needs to be carefully evaluated to create sustainable partnerships.

Table 43. Examples of hybrid distribution partnerships

<i>Model</i>	<i>Example</i>
NGO partnership	E'pap is a South-African company that produces affordable, instant porridge fortified with micronutrients to fight malnutrition. The main share of their distribution goes through an extensive network of NGOs (such as CARE). E'pap now plans to expand through direct sales by leveraging on their brand awareness.
MFI partnership	ekutir is an Indian company that provides market led sanitation for rural communities. The company's revenue model is based on sales of sanitation products, which are bought from local suppliers and national manufacturers and sold to local entrepreneurs, for onward sale to end-consumers. In two of the three states of current operations, their direct implementation partners are MFIs acting as 'ecosystem integrators' as described above and also offering consumer financing.
Cooperatives partnership	Solar Sister works with women's groups to select well-connected sales-agents to distribute solar products in rural Africa. Azadi, AFRipads, Ruby Cup, One Girl and Jayaashree Industries use partners to identify women's groups in local areas for distribution of sanitary pads

Enter and upgrade existing retail networks

This distribution model leverages existing retail channels such as local retail outlets. Existing retail outlets not only have the advantage of proximity; they also have existing relationships with local consumers and may even offer them credit. Successful examples exist across a range of sectors.

One of the key challenges of this model is consumer demand. If there is not explicit demand for the good or service, distribution via existing retail networks will not work. If demand doesn't exist, investment in capacity building for retailers to engage in awareness-raising and demand creation is needed. Retailers will need a sufficient margin in order to make it worthwhile for them to invest in marketing and consumer education, otherwise they are unlikely to be interested in stocking a particular product.

Constraints and Drivers for Growth and Scale

There has been, and continues to be, considerable experimentation with distribution channels that cross the last mile. Lessons are emerging about strengths and weaknesses of different channels, relevance to different situations, and the need for multiple strategies either concurrently or over time. Table 45 summarizes some of the key strengths and challenges across the four models detailed above.

Some channels are more suited to certain types of products, volumes of sales or stages of business. Within any sector, different companies adopt different solutions. Finding the 'right' distribution approach can be challenging, time consuming and costly. Some companies spend

Table 44. Examples for distribution via existing retail networks

<i>Organization</i>	<i>Detail</i>
Dialog Telekom PLC	Mobile telecommunications network operator in Sri Lanka, distributes phone cards and SMS-based airtime top-ups through nearly 40,000 mostly small-scale retailers across the country. The typical Dialog retailer operates a primary business, such as a grocery store, and stocks Dialog products among a range of others.*
Alquería	Dairy company, distributes UHT milk through 125,000 small-scale retailers in Colombia. Such retailers account for 75 percent of the company's sales, whereas supermarkets account for only 25 percent.*
GeReS	Development NGO in Cambodia, trained existing cook stove manufacturers in making improved cook stoves, while organizing the value chain so that each player would make more money than with traditional stoves.
Selling Sanitation Program	Selling Sanitation is a joint IFC-WSP initiative that aims to catalyze the market for household sanitation in Africa by—amongst other things—working with existing large plastic manufacturers to develop new affordable sanitation products and distribution channels to reach underserved consumers.

* Jenkins et al. 2011.

Table 45. Strengths and challenges across different distribution models

<i>Model</i>	<i>Strengths</i>	<i>Challenges</i>
Village Level Entrepreneurs (VLEs)	Deep market penetration, personal relationships and close contact with customers, trust and after-sales service	Sales force and customer retention, making it commercially viable
Proprietary distribution	Low company risk, branding, close customer relationship, suitable for complex products requiring consumer education, after-sales services	Limited ability to reach very remote consumers, high set-up and staff costs
Piggyback on networks of partner organizations	Extended reach and penetration via existing networks, depending on type of partner integration of awareness building and consumer finance	Alignment of partner interests and incentives
Enter and upgrade existing retail networks	Extended reach and penetration via existing networks	High set up and training costs. Sufficient product demand is needed

years piloting different models for sales, distribution and payment. A single company can shift from one channel to another, either because a channel did not work well, or because market size and brand awareness create new parameters. For example, a business in Kenya selling consumer durables such as cook stoves, solar energy products and mobile phones piloted direct sales, kiosk sales, and business-to-business sales before identifying distribution through Savings and Credit Co-operations as the most viable option (Innovations Against Poverty 2013).

For many start-up businesses that often face working capital constraints, extensive trials are not possible without external support. And even if distribution can be successfully set up in one particular region, it does not mean that replication and scale up will not require additional research and investment.

Over the medium to long term, as products become widely known and customers more affluent, more traditional retail channels (e.g. supermarkets or other retail shops) are likely to become more important (Hystra 2013), or new adaptations of last mile channels will be needed.

The driver of innovation in last mile distribution channels is the need for a cost efficient approach suited to the demands of the product or service and the consumer. Amidst a host of products and services targeted at the needs and pockets of low-income consumers, scale is only possible if the appropriate distribution channels are found.

Hence establishment of a strong business case and attractive margins for all stakeholders is crucial to sustain successful distribution and partnerships. Incentives should be proportional to the effort and investment by each partner and should be constantly reviewed and revised to reflect ‘fair’ compensation for services. For example, distributors of consumer durables (such as water filters) expect margins of 8–15 percent while retailers of fast-moving consumer goods (FMCG) products expect 5–10 percent margins. Mobile-based

SunnyMoney: Adapting the distribution model based on market maturity

SunnyMoney is a social enterprise selling solar lights from various brands in Africa. The company has adopted a two-stage distribution model depending on maturity of the target market. Initial market outreach and distribution is done by head teachers—trusted community leaders—who are trained and incentivized with free lights to promote lights to the parents of students. This community-based model enables SunnyMoney to reach large numbers of people without visiting every village and is most appropriate at an early stage, when trust, demand and market penetration are low, and it is vital to reach out to early adopters. Once SunnyMoney's model has catalyzed the market in a certain area, other distributors such as VLEs are more likely to be able to profitably enter the market using other distribution models, creating the ecosystem to service the early adopters and late adopters who will be more willing to invest after witnessing early adopter success (Hystra 2013).

SolarNow and d.light: Contrasting solutions

SolarNow initially sought to set up a VLE franchisee model for distribution of solar household systems. Independent franchisees provided direct sales and installation while SolarNow provided training and support. But due to a lack of quality consistency from franchisees, in 2014 the management decided to switch to a branch model where the company actually employed its own staff to distribute the product (branch distribution). In contrast, d.light which to date has focused more on single and more affordable solar products, came to the conclusion that full-time sales agents exclusively selling d.light products are not a viable distribution option. The company now works with existing retail outlets selling d.light products alongside other products.

information service companies that complement other products are likely to be in revenue share arrangements with partner organizations (Business Innovation Facility 2013).

Other lessons have been learnt about what makes an effective local sales force (Hystra 2013) highlighting the value of good coaches (local managers), use of mobile technology for tracking customers and sales force activity, and a local network of “lead generators,” commission-based local individuals who inform the sales agent that it is worth coming to a village and aggregate orders.

Technology plays an increasing role in successful last mile distribution (World Bank 2015). For some businesses the use of mobile technology is an intrinsic part of their model, hence also features as part of product or service distribution. Mobile health and money are obvious examples but other sectors also leverage new technologies to maximize availability and keep distribution costs low, and manage post-sales services, monitoring and tracking. In the health sector, for example, at the same time that products reach end-users, logistics data needs to flow in the reverse direction so that suppliers understand how much is being consumed in order to plan for procurement and future deliveries. In education, ICT allows companies to develop e-learning products that provide a certain standard of education no matter where the learning is taking place.

Project Last Mile: Better access to medicines in Tanzania and Ghana

Project Last Mile is a public private partnership that applies Coca-Cola's logistic, supply chain, distribution and marketing expertise to help African governments maximize the ability to get medicines and medical supplies to remote communities in Tanzania and Ghana. Through Project Last Mile, the government agencies managing the procurement and efficient distribution of essential medicines and medical supplies benefit from private sector expertise, learning how to forecast demand for medicines and vaccines, better market the availability of such commodities, and ensure the cold chain equipment is maintained properly for storing certain medicines and vaccines. In Tanzania, the Medical Stores Department (MSD) previously delivered medicines to approximately 150 district warehouses with limited sight of distribution to the last mile. As a result of the project, the MSD has expanded its distribution network to service over 5,500 clinics (from an initial 500 delivery points) and improved the availability of medicines, reducing stock replenishment lead times by up to two-thirds (Global Fund 2017). The project was first piloted in Tanzania in 2010 and expanded to Ghana in 2012. It is executed in collaboration with Yale's Global Health Leadership Institute, Accenture Development Partnerships (ADP) and Global Environment & Technology Foundation (GETF).

Roles and Implications for Government

Distribution is a crucial but often challenging and costly part of providing products and services to the BoP. To some extent distribution networks are a public good. While the individual company needs a distribution channel for its products, the testing of what works, and the development of multiple channels and thicker markets, generate positive externalities for others.

Organizations struggle to commercially cover the costs and risks of developing routes to market. There are several ways of how this can be achieved with help from government and/or development agencies. Philanthropic support in the form of grants, soft loans and guarantees can often play a catalytic role, e.g. in helping companies to pilot different distribution models in order to find the best approach.

In addition, the government can also help to facilitate innovative distribution partnerships or can be a distribution partner itself. Local government officials can support distribution, e.g. through aggregation of demand for toilets by village chiefs in the sanitation sector or local education authorities helping to promote products that have positive education outcomes.

National health insurance, pension, postal service and government assistance schemes are all possible distribution routes providing the advantage of existing technology and infrastructure to support operations at scale. Gramin Suvidha Kendra, for example, is a public private partnership model between the Multi Commodity Exchange of India Ltd. (MCX) and India Post, in which MCX leverages the multi-tiered structure of the India Post to provide information services to Indian farmers. Government-led BoP service provision also exists. India's Common Services Centers (CSC) are providing official government

services (video, voice and data content and services) for residents living in remote areas to access services in agriculture, health, education, and utility through local village kiosks. In addition to providing access to public and private services for local residents, the Centers create employment through rural micro-enterprises. Finally, investment in transport infrastructure, whether to remote rural areas or crowded urban settlements, helps the logistics of distribution.

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STRATEGIES TO REACH THE POOR

Making Products and Services Affordable for Low-Income Consumers

Social enterprises are putting products and services in the reach of low-income consumers through innovative design and pricing, flexible payment terms, and consumer financing

HIGHLIGHTS

- Making quality products and services affordable for low-income price-sensitive consumers is challenging due to the need to provide value for money, yet irregular incomes and lack of access to finance limit affordability.
- Inclusive business models use different approaches to improve affordability, such as innovative financing, cross-subsidies, mobile payments, and pay-per-use.



Summary

Affordability is a challenge for low-income consumers for many reasons, and not just because of their low-incomes. Their cash flow is constrained because they have irregular income, frequent cash emergencies and lack access to credit or formal banking. Compared to consumers in middle-income markets, they typically have different needs, are more risk-averse and have less familiarity with new products, all of which also affect their willingness to pay for some products.

There has been considerable innovation in the last decade to address these issues. Innovative product design and use of technology has helped to reduce the absolute cost of some products. New ways of financing and cross-subsidizing products have also been developed. Models that match consumers' cash flow have extended from simple "single sachet" strategies to sophisticated solutions that harness cutting-edge information

communication technology (ICT) to allow pay-per-use and products with other forms of built-in consumer finance.

Challenge

Innovative products and services designed to meet the specific needs of low-income customers and underserved markets need to be affordable (Koh et al. 2014). There are four main affordability challenges that social enterprises must address:

- The cost of products is too high for a low-income consumer. Many products have been developed for higher-income consumers, and so it has been impossible for a company to develop a commercially viable business model for selling the products to a low-income consumer.
- Willingness to pay is hard to determine among low-income consumers. A lower price by itself may be insufficient to unlock demand among low-income consumers. Often assumptions about what low-income consumers either need or want are wrong (World Business Council for Sustainable Development 2014), and so an enterprise will not know which features and benefits of a product to retain or dispense with. Some companies are now doing thorough consumer research with low-income people, for example asking them which flavors they like in food items and which fragrances they prefer in hygiene products (World Business Council for Sustainable Development 2014).
- Irregular and constrained cash flows. Income is often unstable and irregular for low-income people, since they often work as casual labor or can only sell produce at certain times of the year. Consumers are unable to make single large payments and require financing assistance. They also lack access to suitable sources of credit, bank accounts or other financial services that could help them to save or smooth out their income.
- Additional cost of serving BoP markets. There are multiple challenges when developing a product for low-income consumers, from raising awareness about product benefits to the relatively high distribution costs imposed by rural and dispersed communities (World Bank. 2017a). There is a growing recognition that high-volume, low-margin business models may not work in such contexts and that enterprises will have to either bear additional costs by building high margins into their pricing structure, or get external financial assistance in the early years of a new product rollout (Simanis 2012; Hystra 2013).

However, for some products, such as energy and water, low-income consumer can often pay higher prices per unit than more affluent consumers, and what they are able to access may also be lower quality. For example slum residents are often viewed as non-paying and defaulting customers for grid electricity, but there are instances where they pay a significant share of their incomes for energy connections from local illegal operators, or alternate energy

sources such as kerosene lamps, candles, or batteries (World Bank. 2017b). Low-income people also often pay for health and education services, and in emergencies the former can be a devastating cost for a family living on a low-income. The quality of provision is also often very low, and consumers can easily be sold fake products or expired products, such as medicines, that render them ineffective (Business Call to Action. 2012). Therefore, innovation in affordability also depends on substituting quality products to replace inferior ones at existing price points.

Innovative Approaches

Innovative approaches to addressing the challenge of affordability fall into the four main areas explained in table 46.

These four areas described in table 1 are often linked, as, for example, access to consumer finance is very helpful to consumers with uneven cash flows. Each approach is covered in further detail below.

Reducing product cost

The innovation inspired by C.K. Prahalad and Hall’s “Fortune at the bottom of the pyramid” (Prahalad and Hart 2001) led to a surge of entrepreneurial activity that has often addressed affordability as a challenge. Table 47 outlines several ways in which enterprises are reducing the cost of products.

As table 48 shows, some businesses focus on stripping down product design to leave the essential functionality that is wanted by low-income consumers. Others reduce costs by creative approaches to distribution or use of ICT. Several apply multiple strategies. For example enterprises supplying de-centralized clean and safe water use a combination of a

Table 46. Areas of innovation to address affordability

<i>Area of innovation</i>	<i>Description</i>
Reducing product cost	Adapting the business model to reduce total cost and increase affordability.
Matching cash flow	Making a low cost product accessible by matching the cash flow of low-income consumers.
Providing consumer finance	Using consumer finance to increase low-income consumer’s ability to access products.
Assisting with payment	Reducing the cost that low-income consumers have to pay for products by assisting them with payment through cross-subsidies and other means.

Table 47. Summary of innovative approaches to reducing cost of a product

Approach	Detail	Examples
Re-designing the product or business model	Taking a product and business model that is serving a middle class market and re-designing it for low-income consumers such that the quality of the product remains but the cost is significantly lower	<ul style="list-style-type: none"> • Jacaranda in Kenya has redesigned health delivery such that its nurses provide all clinical care, while assistants provide non-clinical care and community health workers manage home visits and client education. • Hydrologic, a Cambodian enterprise, manufactures low-cost clay-based filters for home water treatment that use the same technology as water filters that are manufactured for middle class consumers but have a cheaper case and fittings.
Using ICT or other technology to reduce cost of delivery of a product	This is similar to the above, but may not require product re-design. It specifically involves the use of ICT and other new technology to make a significant reduction in the cost paid by low-income consumers	<ul style="list-style-type: none"> • Remote monitoring of water meters allows WaterHealth to provide quick responses when there are problems while maintaining a very small team of technical staff. • mHealth is a tool to make health services more efficient and effective, improving the health outcomes for any person with access to a mobile device. Affordability is achieved by enabling remote access to doctors, which also ensures that their time, which will be an expensive component of the business model, is used very efficiently. • Education enterprises such as BridgelT use ICT for product delivery, which enables large scaling and lower prices and Wizzit, based in South Africa, estimates that their mobile banking service can be up to 30 percent cheaper for customers than regular banks.
Standardized products	Standardizing a product or process that may be quite flexible and tailored when delivered to a middle class market. Making it standard will retain the essential quality but remove the costs of some 'nice to have' features.	<ul style="list-style-type: none"> • Micro-insurance products such as Guy Carpenter & Co LLC, part of GIIIF, Mozambique, use portfolio pricing and standard indices to assess risk and decide when to make payments to customers which saves the transaction costs of individual premiums and claim assessment. • LifeSpring Maternity Hospitals have developed a model that has a tight focus and standard operating procedures for all of its treatments. Patients with non-standard needs are quickly referred to other hospitals. • De-centralized water treatment enterprises such as Safe Water Network develop a standard model, which allows easy replication with low transaction costs.

Table 47. Summary of innovative approaches to reducing cost of a product (continued)

<i>Approach</i>	<i>Detail</i>	<i>Examples</i>
Shared access	Reducing the cost of a product to an individual user by sharing the cost with other users who are able to access the same product.	<ul style="list-style-type: none"> • LYDEC in Morocco install collective meters for households that could not afford individual connection to grid electricity. • Water utilities such as JIRAMA in Madagascar partner with community groups to run water kiosks to deliver water from the piped network to many customers, which saves the cost of individual connections. Cost savings are shared with consumers through a block tariff that is lower than a domestic tariff per unit of water supplied.
Self-delivery	Taking a product where the usual delivery mechanism is part of the product and getting the consumer to undertake their own delivery (or collection).	<ul style="list-style-type: none"> • Indian education provider Avanti uses peer-to-peer instruction, which cost a fraction of private coaching institutes (World Bank 2017c). • De-centralized water treatment enterprises such as WaterHealth Ghana have an option of buying water at kiosks, which costs less than half the price of water delivered to the home.
Using volunteers	Taking roles that would usually be undertaken by paid staff and enlisting volunteers to do so at a much lower cost.	<ul style="list-style-type: none"> • Limited Resource Teacher Training keeps costs of its education service low by employing volunteer teacher trainers.

standardized product (clean water in 20 liter containers), shared access (through sales at a single stand pipe or water kiosk), and self-delivery (in which customers collect the water in person and carry it to their households) (World Bank 2017d).

Matching cash flow

Some of the earliest BoP innovation took place when it was realized that low-income people were interested in buying consumer products but did not have sufficient cash flow to access products such as shampoos aimed at the more affluent middle classes. The approach taken by early innovators to address this desire to consume was to break down multiple serving packaging into single use sachets that could be bought when the consumer had some cash in hand and wanted to use the product immediately. There is now a much wider variety of approaches to matching low-income consumer’s uneven cash flow, as table 48 describes.

The use of ICT has been key to the development of innovative ways of allowing payment by very small installments to match consumers’ cash flow as explained in detail in the paper, “Information Communication Technology (ICT) as an Enabler,” which is in the same series as this one that summarizes how ICT is helping with business model innovation (World Bank

Table 48. Summary of innovative approaches to matching the cash flow of low-income consumers

<i>Approach</i>	<i>Detail</i>	<i>Examples</i>
Paying for a product by installments in lease-to-own models.	Breaking down a payment into multiple small payments, often facilitated by access to finance, with ownership transferred to the consumer once the full product and finance costs have been paid.	<ul style="list-style-type: none"> • Customers purchasing WaterSHED toilets in Cambodia pay a small up-front fee for the latrine, followed by regular, fixed payments for 18 months, at which point they gain full ownership of the toilet (World Bank. 2017e). • M-KOPA in East Africa sells small solar units with embedded GSM sensors in each solar system allowing M-KOPA to regulate usage based upon payments. Once they have paid in full the device is unlocked for permanent use (M-Kopa Solar. n.d.). • Tugende, a company that sells vehicles to boda (motorcycle taxi) drivers in Uganda, offers a lease-to-own scheme where drivers can purchase a bike for a small down payment and then pay weekly installments until they have covered the costs of the asset and the finance (World Bank 2017f).
Pay-per-use models	The consumer makes a small payment when they want to utilize the product's benefits for a limited time but never own the product.	<ul style="list-style-type: none"> • Electricidade de Moçambique (EDM) uses prepaid metering systems, which allow its customers to decide how much they are able to consume and spend on electricity. • Claro Energy sells its irrigation pumps to franchisee farmers in India, who then rent them out to other farmers who only need them from time to time.
Small servings	In this model the product is broken down into very small portions such that the consumer only pays for what they need in the immediate future and does not pay for a 'stock' of the product for future use.	<ul style="list-style-type: none"> • Delivering soaps and shampoos in sachets rather than larger, multi-use containers has become a staple part of FMCG in many developing countries. Companies such as Hindustan Unilever Ltd (HUL) in India pioneered this approach and are now taking the same approach into more developed markets (Vijayraghavan 2012). This makes the cost per unit of product higher but makes them accessible to low-income consumers. • Many mobile phone companies also sell scratch cards that allow small amounts of airtime to be bought instead of insisting on a contract.
Flexible terms	Allowing some free access to a service when customers cannot make one of their regular payments. This free access is at a time period chosen by the consumer to match periods of particular financial stress.	<ul style="list-style-type: none"> • Chain school Omega has flexible payment schedules that are aligned with BoP customers' irregular income patterns. Omega allows parents several fee-free school days each term (World Bank 2017g).

2017h). Two such innovations are particularly relevant to affordability. Firstly, payments by mobile phone or scratch cards enable low-cost means of making small payments. Secondly, technology allows payment to be linked to unlocking usage, thus incentivizing continued payment much more strongly than in a conventional consumer financing scheme, where repossession is the ultimate sanction.

Providing consumer finance

Consumer finance in various forms is an important component of many business models that are making products more affordable and cash flow more manageable. Offering payment on installment terms is in effect a credit arrangement, although the consumer may never perceive it as such. In other cases, an explicit credit arrangement is made. There are two basic approaches to how this finance can be delivered. Table 49 summarizes these approaches, with examples.

Table 49. Summary of innovative approaches to financing for affordability

<i>Approach</i>	<i>Detail</i>	<i>Examples</i>
Providing finance with the product	An enterprise selling a product where a one off payment would be too large for a low-income customer, may choose to provide financing to allow payment in installments or leasing	<ul style="list-style-type: none"> • Échale a tu Casa, a company in the Self-Build housing sector in Mexico has a bank loan at 8 percent to cover its working capital and it charges its customers an interest rate of 12 percent (World Bank 2017e). • Proximity Designs sells their irrigation pumps in Myanmar by providing low-interest loans with only 10 percent interest rate to customers. Full repayment of the loan is due by the second harvest after it is taken out (World Bank 2017i).
Partnering with external finance provider	Similar to the above, some enterprises partner with a specialized finance provider for consumer finance for their products	<ul style="list-style-type: none"> • EVN Bulgaria partnered with a microcredit organization to facilitate a one-year loan for customers to meet the upfront investment of a grid connection. • Larger home solar product sellers such as Grameen Shakti offer financing of their system through traditional in-house micro-credits schemes, whereas smaller businesses such as Zara Solar, Barefoot Power or SELCO partner with finance institutions (both MFIs and banks) to make their products affordable.

Assisting with payment

There are many ways in which part of the costs of a product or service can be paid by a third party, so only a fraction falls on the low-income end user. This is particularly the case where products have a strong element of public good, such as health and education services. The enterprise approach is still very much part of these models to ensure effective use of the subsidy and to be the engine for sustainability of the model, as shown in the examples given in table 50.

The input from governments, donors, or others, is often performing a dual role in making a product more affordable but also driving uptake of new products where a lack of awareness of the product benefit may also be an issue. This is certainly the case for micro-insurance products.

Table 50. Summary of innovative approaches to use of subsidy and cross-subsidy

<i>Approach</i>	<i>Detail</i>	<i>Examples</i>
Sharing of the cost by a third party with an interest in contributing to the social outcomes, such as a public body, NGO or large company.	The government or a large company is prepared to subsidize some of the costs to make a product more affordable for low-income customers. For goods such as water, this is often a model whereby the users payments cover operational costs and public /charitable funds cover the capital costs.	<ul style="list-style-type: none"> • BridgelT requires governments and technology partners in the Philippines to each bear about half the costs related to school roll-outs (World Bank 2017j). • Clinic chain Pushpagari Eye Institute provides 80 per cent of their services for free to the poorest of the poor. It is a long-standing beneficiary of Sri Rajiv Aarogyasri scheme of the Government of Andhra Pradesh to subsidize the cost of its health services (World Bank 2017k). • WaterHealth Ghana covers all operational costs related to providing clean water to its customers, including staff and maintenance costs. The cost of the filtration equipment and all other infrastructure is paid for by WaterHealth, which raises finance from grants and impact investors.
Cross-subsidization between clients	Segmenting consumers according to their ability to pay and then using the higher margins from sales to better off customers, to reduce the cost to low-income consumers.	<ul style="list-style-type: none"> • Chain school Vienova reserves 20 percent of its revenues for scholarships for students from low-income households (World Bank 2017g). • Women's health franchise Merrygold employs a cross-subsidy model of tiered pricing charging different customer groups at different rates. This enables the business to charge 50 to 60 percent below market price to its low-income patients who make up over 70 percent of the client base (World Bank 2017l).

In other cases, the main reason for governments to procure provision of services or cover part of the costs, is to meet public responsibilities, such as in health. It may be that the public sector is not able to offer a high quality service on its own, but by contributing to the costs of private provision to the BoP, it can make a high quality private service more available to people with lower incomes than would otherwise be the case.

Constraints and Drivers for Growth and Scale

There has been a great deal of progress in making products for low-income consumers more affordable. There has been successful innovation in reducing cost and matching low-income people's cash flow. The key drivers of progress so far are:

- Growing recognition of the BoP market—not just the size of the consumer base, but the willingness of low-income people to buy products that meet their needs and aspirations.
- For-profit companies see an opportunity to sell low-cost versions of their products, or add new products to their range, and therefore access a large number of new customers.
- A growing number of not-for profit social enterprises that exist to address the low-income people's basic needs through the development of affordable new products and services.
- Use of ICT, money transfer, and other technology that have created opportunities to alter payment mechanisms with low costs.

Despite strong drivers and progress, there are also limiting factors on how affordable products and services can be:

- Prices cannot be lowered so far that they impair the quality of the product. Cheap versions of products that are not durable carry a much higher 'lifetime cost' than the version produced by a social enterprise that is designed to maximize user benefits rather than to minimize the up-front cost. Products that are only designed with cost in mind can be bad for consumers and ultimately bad for the business.
- The costs of providing products to low-income consumers are often inherently high. BoP consumers often live in remote, rural locations with high distribution costs. They require consumer finance that can require high transaction costs. Expensive high-touch marketing may be needed, to raise consumer awareness or provide training and education on how to use products.
- Affordability cannot compromise the sustainability of the business model. In recent years the focus has shifted from focusing only on affordability through achieving a low up-front product cost to greater consideration of the sustainability of the business model, because an affordable product that is driven by subsidy will only benefit consumers for a short time. Instead the affordable product should deliver both value to the consumer but is also financially viable for the enterprise (Business Innovation Facility 2012; Narsalay et al. 2012). A high margin model based on more effective

Toyola—Customers choosing whether to cut risk or cost

Toyola, an enterprise selling cook stoves, offered an 11 percent discount to customers that paid cash. They also gave them an option to forego this discount and test the cook stove at home first, while putting aside savings from their reduced use of charcoal so that they can assess the amount that they are actually saving. About 50 per cent of customers preferred to pay more so that they could verify the cost saving of the stove that would accrue over time.

selling of the lifetime value of a product will sometimes be the only successful strategy available (Hystra 2013).

Pure affordability of high quality products may not be as much as a constraint as it appears, as low-income consumers are also not always interested in the lowest possible cost. Research suggests that low-income consumers have a strategy of minimizing their risks instead, to ensure that the money that they do spend can deliver the benefits that they were looking for, as the Toyola example in box 1 illustrates (Simanis 2012).

Roles and Implications for Government

There are a number of helpful roles that government can play to stimulate further innovation towards greater affordability of beneficial products, although in many countries governments have not yet created a business climate or regulatory environment where inclusive business can thrive (see, for example, Asian Development Bank country studies such as ADB 2013).

Private organizations have generally taken the lead in stimulating and supporting technical innovation that can provide the opportunity to produce high quality products at lower cost. Instruments used by private actors, such as incubators and accelerators that bring together Universities, NGOs and companies (Open University Business School 2015; Inclusive Business Accelerator (IBA) n.d.), and the use of grants and prizes for inventors with promising ideas (Ashden Awards n.d.), are available to governments also.

For innovations that depend on ICT, when governments react quickly to register new products, it allows innovation to happen in a way that also protects consumer rights. For example, Nigeria's National Agency for Food and Drug Administration and Control (NAFDAC), endorsed Sproxil's Mobile Product Authentication™ service before it was even deployed in the country (Sproxil 2015). This allows consumers to verify that that are getting the quality of medicine that they are paying for.

However, when the regulatory backing for an affordable product is not in place this can hinder innovation. For example, Abellon Clean Energy has a successful bio-pellet business in India selling safe and affordable fuel solutions to low-income consumers, but a different and difficult regulatory context has hindered its expansion into Ghana (Ashley and Sivakumaran 2014). Such constraints apply in the mobile money space as well. Some

governments, such as the South African Reserve Bank have taken a cautious view of mobile-based financial products, which also has the effect of reducing the rate of innovation (South African Reserve Bank 2009). On the other hand, as the South African Reserve Bank also points out, failing to regulate some forms of financial products well enough may lead to low-income consumers being put at excessive risk.

Other government initiatives have been more helpful in stimulating roll out of innovations that allow those on very low-incomes to access products that otherwise would be beyond their reach. Vortex Engineering, an Indian company in the financial sector, has benefitted from government support to set up ATMs in rural areas. The government of India has also supported training organizations by giving them access to credit at a concessional rate which has helped them to scale, which is a better alternative than the Government directly providing training itself as their contribution is leveraged by private sources (ADB 2012).

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STRATEGIES TO REACH THE POOR

Using Information Communication Technology as an Enabler

Companies employ ICT solutions to benefit low-income consumers and unlock opportunities for scale

HIGHLIGHTS

- ICT solutions can give low-income consumers in remote and rural areas access to affordable essential goods and services, particularly in health, education and finance.
- Inclusive enterprises are developing solutions that use mobile and other information technology to improve access and quality of services, such as Internet kiosks for payments and smartphones for medical information for health professionals.



Summary

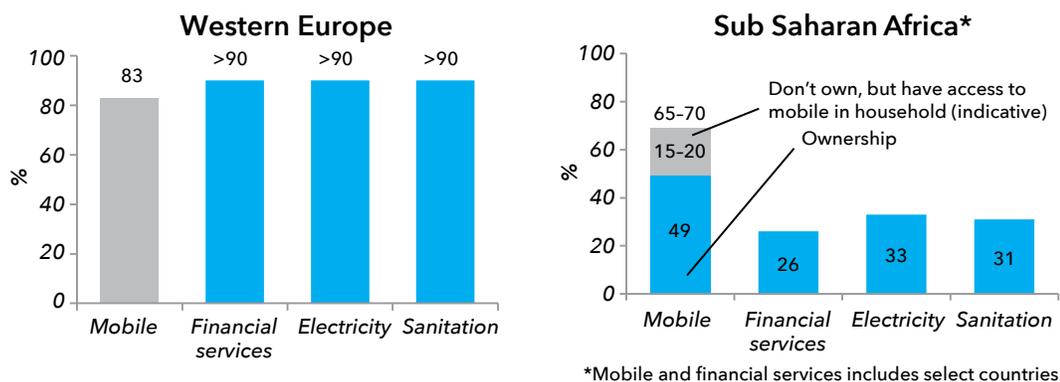
With the rapid spread of the internet and mobile technology to developing countries in recent years, ICT solutions are increasingly being seen as key enablers to solving development challenges. These solutions can deliver expertise and information to low-income consumers who do not have the physical or financial access to critical resources. They allow people living in hard to reach areas to access essential goods and services and provide them with opportunities to significantly improve their lives. The use of ICT also unlocks opportunities for growth and scale for companies working at the Base of the Pyramid (BoP). Companies are able to vastly increase their reach, reduce operating costs and improve efficiency by integrating ICT into their operations.

Across sectors and regions, companies are developing models that use mobile and other information technology to improve the quality and accessibility of essential goods and services to low-income consumers.

Challenge

Companies are using ICT in their business models to address the critical challenges of both access to essential goods and services and affordability for BoP consumers. While the penetration rate of ICT, particularly mobiles, has risen in the developing world and is now comparable to the developed world, access to basic services continues to remain woefully short. Figure 27 from GSMA's 2013 *Scaling Mobile for Development* report (GSMA 2013) illustrates this point. If mobile can be used to boost access to finance, energy, and sanitation by overcoming some of the many problems of reach to BOP consumers, this gap can close.

Figure 27. Comparison of access to basic services



Source: GSMA Intelligence, GSMA Mobile Money program, IEA, World Bank, MDI Analysis

Two of the reasons for this gap in access to services can be tackled by ICT:

- **Lack of infrastructure in remote or low-income areas.** Due to limited and poor quality basic infrastructure and a resulting unwillingness of service providers to expand to these areas due to high costs, inhabitants lack access to critical goods and services including banks, medical experts, quality education materials and electricity. The integration of ICT can partially remove the need for physical distribution of these services allowing remote access, or can ease the payment for goods and services that have to be physically distributed.
- **Lack of access to information.** Low-income people have little access to information about the choices that are available to them. Without information they cannot make discerning decisions on critical matters such as which drug to use and for how long. With more information available where they live, people would be able to spend less time and money on travelling long distances in search of this information. By providing information services through ICT, people can access critical information directly on their mobile phones and other devices.

From the perspective of social enterprises and innovators, reaching the BoP with basic goods and services comes with huge challenges, particularly if their aim is to be competitive and financially sustainable. ICT can help with challenges such as:

- High cost of cash payments in fragmented, dispersed markets, plus high risk of lost cash
- Need for micro-payments to boost affordability
- High cost of transporting and situating experts in low-income settings
- Difficulty of maintaining good records of product and service quality and usage

Innovative Approaches

As technology has advanced, so have the opportunities for companies to leverage it and use it to unlock the possibilities for reach, scale and better quality service provision at the BoP. Across sectors, companies' approaches can be broken down into four broad areas that are enabled by ICT: service delivery, access to information, payments and analytics. Table 51 summarizes these four with examples.

Table 51. Examples of ICT enabled solutions in four key areas

<i>Areas</i>	<i>Ability to enable</i>	<i>Examples</i>
1. Service Delivery	ICT allows companies to improve the reach and quality of their service provision by enabling affordable remote access of good quality essential services.	<ul style="list-style-type: none"> • ClickMedix's mobile application translates a clinical protocol into a series of questions on a smart phone or tablet that can be used by a semi-skilled health worker working in rural areas to gather and send information to an expert doctor in a clinic elsewhere who makes the diagnosis (Practitioner Hub for Inclusive Business. n.d.). • Datawind's low-cost affordable 'Aakash' tablets provide educational and internet based services to low-income people who previously had limited access to educational materials.
2. Access to Information	ICT allows companies to provide vital information services to BoP consumers.	<ul style="list-style-type: none"> • n-Logue's wireless Internet kiosks in Indian villages enable quick access to information on education, healthcare, consultancy and governance.
3. Payments	ICT solutions enable companies to provide easy and affordable payment services.	<ul style="list-style-type: none"> • bKash in Bangladesh enables low-income consumers to make easy payments to businesses as well as person to person money transfers through basic mobile phones.
4. Analytics	ICT allows companies to manage their supply chains and track performance of distributors to improve transparency and efficiency.	<ul style="list-style-type: none"> • Pollinate Energy monitors all solar light sales made and all cash payments received by its local agents through smart-phones that they train the agents to use.

Service Delivery

ICT solutions are enabling companies to deliver good quality, essential services to low-income consumers. This has been particularly effective in the delivery of education and healthcare.

In the health sector, ICT solutions fill the health infrastructure gap in rural areas by providing remote diagnostics, monitoring and follow-up while reducing the cost of care. ICT solutions increase the reach of centrally positioned health professionals in secondary and tertiary health centers. These professionals are able to provide healthcare in underserved areas through telemedicine and specially designed applications. MeraDoctor, a healthcare enterprise in India, connects patients in remote areas with qualified doctors for consultations. Patients send information on their medical condition over a phone messaging service to get guidance on whether they should self-treat with Over-the-Counter (OTC) remedies or go to a doctor or specialist for more tests.

In education, ICT allows companies to develop e-learning products that provide a certain standard of education no matter where the learning is taking place. With the ever decreasing cost of data tablets, a number of businesses are developing affordable products that are enabling access to education over the internet for those living at the BoP. iSchool in Zambia has designed low-cost e-learning tablets that are pre-loaded with courses that teach the entire Zambian curriculum from Grades 1 to 7 in English and eight local languages. These courses are designed to develop critical thinking in children and help Zambian teachers move away from the rote learning approach of many low-income schools (Business Innovation Facility 2014).

ICT is being used by companies in the low-income employment sector as well to help connect those working in the informal sector to employers that provide a decent pay and work conditions. Babajob.com has developed a set of ICT solutions for job seekers in the informal sector in India that include a mobile application, SMS, web and voice-based services (Venkatesan 2015).

Access to information

ICT solutions have made information readily and easily available to low-income consumers who previously had little access to it. Companies are now developing services that provide vital information to consumers at the click of a button. Healthcare firm Sproxil is tackling the problem of counterfeit drugs in Sub-Saharan Africa through a simple SMS system. Customers can confirm that the medicine they are buying is legitimate before they leave the pharmacy by sending an identification code by free SMS and receiving an immediate response in the local language.

Payments

ICT is helping companies unlock payments at the BoP. These could be payments between people, payments for services and provision of credit.

Mobile money is an ICT solution that is increasing access to financial services such as money transfers, remittances and savings for low-income consumers. Companies that provide this solution have much further reach, lower operating costs and have much fewer customer requirements than traditional financial institutions. In South Africa, WIZZIT offers a low-cost bank account that uses mobile phones for making person-to-person payments, transfers and pre-paid purchases.

Companies outside the financial services space are partnering with these mobile money providers to make payments for other services easier for their BoP customers. This model is being used in the energy sector, in particular, to allow customers to pay for solar home systems. M-Kopa sells solar home systems to its customers in Kenya on an affordable one year mobile money payment plan through the M-Pesa payment platform.

ICT is also being leveraged to generate and provide credit to low-income people. Many online micro-lending platforms have been set up in recent years that match micro-entrepreneurs without access to affordable traditional finance with small investors looking for socially beneficial investment opportunities. Investors choose where to invest their money by viewing the profiles of entrepreneurs on a website. The money is deposited online and disbursed to the entrepreneur as a loan that is paid back over time.

Analytics

Transparency and efficiency of service delivery is critical when catering to people living at the BoP. Since the final point of delivery is often in remote areas, managing supply chains and tracking performance of distributors can be difficult and expensive. Companies are developing ICT solutions to gather these important analytics to streamline processes and ensure efficiency. In Sub-Saharan Africa where stock-outs of crucial medicines are a persistent problem, a public-private partnership in Tanzania called SMS for Life has developed a solution for monitoring the availability of drugs in remote health centers. Text messages are used to prompt healthcare staff in rural facilities to check the remaining stock of medicines each week. Health facility workers reply with an SMS to a toll-free number, and are rewarded with free airtime for their responses to weekly stock requests. This information is stored in a central database. The district management team can monitor stock levels remotely and in real-time via the Internet, smart phone or e-mail and re-distribute existing medicines or schedule new drug deliveries when and where they are needed.

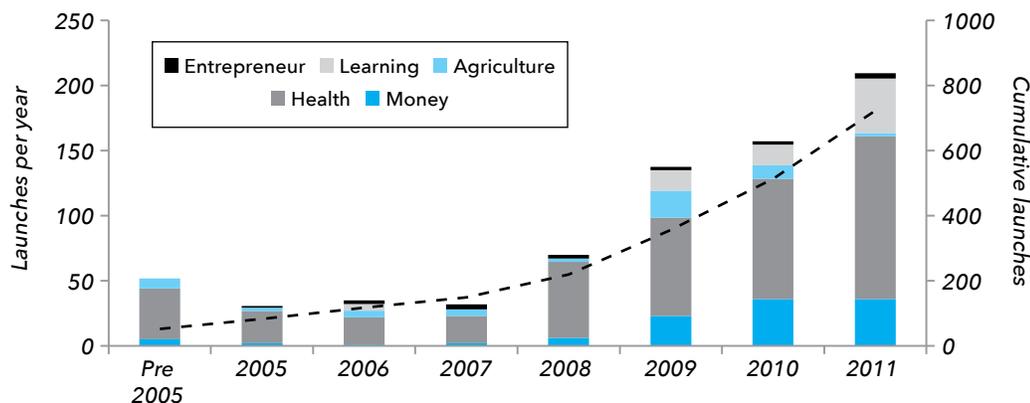
The ubiquity of mobile phones is also allowing companies to access survey and feedback data about their target consumers like never before. NGO Text to Change provides market research services to organizations seeking to improve their social impact. Text to Change conducts surveys with low-income consumers using a mobile phone platform that encourages people to register for the free SMS survey in return for mobile airtime.

Progress

With rapid global penetration and constant development of new and affordable technologies, the ICT sector has provided the ideal platform for companies and innovators seeking

to improve their impact at the BoP. The mobile for development (M4D) space has made rapid progress in recent years. In 2013, GSMA reported that over 1,300 M4D programs were being run by 600 organizations (GSMA 2013). The healthcare sector accounts for a majority of the ICT-enabled business models although other sectors have been catching up, with financial services leading the way.

Figure 28. Timeline of M4D launches across sectors in the developing world



Note: Figures based only on mobile-enabled products and services in developing world by GSMA (including those merged/closed). Excludes services in pipeline with an impending launch.

Source: MDI Analysis.

mHealth solutions continue to increase their impact. Many pilot projects have been successful and been converted into a regular part of health interventions. MeraDoctor has provided 50,000 consultations via its messaging service which has provided over 16 million verifications on prescription drugs. Mobile money models, however, have enjoyed the most rapid scale with the number of mobile money accounts at 103 million and the number of mobile money outlets at 2.3 million in December 2014. Twenty one services have more than one million active accounts (usage at least once every 90 days) with five of these services reporting more than five million active accounts (GSMA 2015). M-Pesa has one of the highest subscriber bases with 15 million registered users in 2013 (Cisco 2013).

An early dependence on donor driven models in this space is now being replaced by both end user and B2B revenue models (GSMA 2015). This could be a reflection of consumer driven business models in various sectors (e.g. mobile money), but also likely due to a greater awareness amongst organizations that financially sustainable business models are a key factor in increasing scale and maximizing impact for development.

Drivers and Constraints for Growth and Scale

Despite rapid progress, ICT is not a panacea. Many ICT enabled businesses are still young and are yet to prove viability. Moreover, growth has been uneven and has been sector or region specific.

Regulation has been a key factor in this uneven growth. The M-Pesa example illustrates this point well. When the M-Pesa mobile money service was launched in Kenya

in 2007, there was little regulation in this field. The company was able to grow rapidly thanks to a local government that was receptive to innovation. When the same service expanded to India, it faced many more regulatory barriers and as a result the growth trajectory has been slow.

Resistance from traditional business models that are threatened by ICT enabled models providing more affordable and better quality services is another constraint. Mobile money services have to compete with traditional banks that have a stronger government lobby in many countries.

Finally, it is important to recognize that ICT models can't replace investment in physical infrastructure. ICT solutions can provide information on prices and markets but if decent quality roads and transportation don't exist to transport goods then the impact remains limited.

The key driver is the growth of ICT penetration at the BoP. The International Telecommunications Union estimated that the number of mobile subscriptions in the world hit the 7 billion mark in early 2014, with mobile penetration in the developing world reaching 89% by the end of 2013 (ITU 2014). It also predicted that the number of Internet users globally reached almost 3 billion by the end of 2014, two thirds of these being from the developing world.

Public and private investment in ICT infrastructure has allowed steady growth in recent years. The World Bank Group has been hugely successful in fostering private investment in mobile telecommunications, attracting an estimated US\$30 billion in private investment for mobile network infrastructure in International Development Association (IDA) countries (World Bank 2012). Governments are also making significant investments in infrastructure to support ICT services. For example, in 2011, three submarine data cables were installed off the coast of Africa quadrupling mobile data speeds and cutting prices by 90 percent in connected countries (World Business Council for Sustainable Development 2012).

Constant innovation in technology and the emergence of cross-industry partnerships have been key success factors for ICT-led development. Partnerships between mobile money platforms and companies in other sectors to enable affordable payments have unlocked growth in key areas such as off-grid energy.

Roles and Implications for Government

Governments play a key role in promoting the use of ICT solutions for development challenges by companies. While the innovation comes from the private sector, policy makers provide the infrastructure and enablers for growth.

The World Bank's 2012 ICT Strategy discusses strategies that governments can adopt to spur growth (World Bank 2012). These include:

- 1) *Catalyzing private sector investment in ICT infrastructure.* Public financing is needed to catalyze private investment in national infrastructure, cross-border links, and international submarine cables. In countries where private investment is insufficient, governments need to allocate public funds to support Public Private

Box 1: Examples of Government-led ICT initiatives

Colombia's 'Vive Digital' strategy, launched in 2010, has been highly successful in increasing internet access for its citizens, particularly those living at the BoP. This has been achieved through favorable policies that have encouraged private sector players to enter this space. These policies include the elimination of sales taxes and other duties on computers as well as the provision of subsidies to lower income people that cover part of a monthly internet plan or part of the purchase value of a computer. Four years after 'Vive Digital' was implemented, the number of broadband connections had increased from 3.1 million connections to 9.9 million and internet penetration for small and medium enterprises went from 7 percent to more than 60 percent.

The Government of India's 'Digital India' initiative, announced in 2014, is a good example of policy makers recognizing the transformative potential of ICT. As part of the initiative, the government will spend more than US\$150 billion in the next five years to bring internet connectivity to all citizens. The plan will integrate a number of ICT initiatives including the national broadband plan to connect 250,000 villages by the end of 2016, a plan to ensure universal access to mobile phones and the creation of skills development centers that will produce a workforce for the electronics sector.

Partnerships (PPPs) aimed at catalyzing further private investment. Since private investment is often forthcoming for ICT projects, actual infrastructure costs are relatively low and PPPs usually only require a fraction of the investment needed for other infrastructure sectors.

- 2) **Taking an active role in enhancing competitiveness of IT-based service industries.** In countries with thriving IT-based industries, the government has taken a leading role in promoting the use of ICT. This is done by ensuring the right infrastructure is in place, establishing IT parks, improving awareness etc. Commitment from those in the top tier of government can lead to the rapid implementation of policies and efficient delivery.
- 3) **Promoting a skilled workforce.** The public sector needs to work closely with the private sector to promote a workforce that has appropriate IT skills. Human capital is a critical component in developing an IT industry and establishing a culture of ICT entrepreneurship.
- 4) **Providing incentives.** Apart from benefiting the BoP directly, ICT solutions help enterprises reduce their operating costs, improve internal management and increase access to new innovations and information. Governments can put favorable license and taxation policies in place to encourage uptake of ICT by businesses.
- 5) **Developing a holistic innovation policy.** Policies should be developed that strengthen the coordination and collaboration among key stakeholders including technology firms, SMEs, and end-users. Development strategies should support piloting and prototyping of new technologies across the value chain, promote and support cross-cutting technologies and their inclusion in projects for key sectors.
- 6) **Calibrating their interventions.** The M-Pesa example discussed above demonstrates the need for governments to understand where intervention can facilitate or stifle innovation. M-Pesa thrived due to light government intervention in India but was hindered due to heavy-handed regulation in India. The cross-sectoral nature of these innovations means that regulation in one sector can have unintended and significant effects on innovation. Rather than direct regulation, governments can enable innovation through measures such as up-skilling the workforce and promoting entrepreneurship.

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SCALING IMPACT



SCALING IMPACT

Gathering and Using Evidence to Scale Inclusive Business Models

Approaches for collecting and using data to measure performance and impact

HIGHLIGHTS

- Collect evidencing on performance can be costly, however there are multiple sources, business uses and drivers to do so.
- This paper examines considerations for measuring impacts and outcomes, such as the social performance value chain, narrow versus wider outcomes, and standards and spectrums of evidence.



Introduction

This chapter summarizes the approaches to gathering and using data that are applied by innovative businesses providing education, energy, finance, health, and water and sanitation services at the Bottom of the Pyramid (BoP).

Innovative businesses serving the BoP seek to find new solutions to social challenges in markets that are tough, dynamic and often highly informal. These businesses usually face urgent operational questions to get business models right, with limited resources or time for gathering data themselves. Businesses face the challenge—*how can they get the information they need to meet customer needs, track social performance and secure necessary partnerships to scale, with minimal business burden?* While investors and donors face a similar challenge—*how can an evidence base be supported, interpreted and used to make good, impactful investment decisions?*

The following factors underpin this challenge:

- **Limited resources:** Businesses must keep operating costs low in order to deliver value and viability in low-income markets. Data collection must therefore be lean and low cost. Major evaluations typically require grant funding.
- **Rapidly changing data needs:** Businesses serving the BoP operate in nascent, informal and dynamic markets. In such contexts business models are frequently required to evolve and change. Data needs may change, and existing social performance information become outdated as businesses pivot.
- **Lack of conventional data management and analysis skills in small and growing businesses:** Early stage businesses often lack in-house experience of management information systems, designing research and interpreting data.
- **Lack of publically available market information:** Informal markets are typified by a paucity of publically available data on demographics, consumer spending habits, and employment trends.
- **Ensuring data collection is 'client centered' and sensitive to local communities:** Businesses targeting social impact may operate in communities that have already been researched extensively by donors, NGOs and others. Ensuring ethical standards of research, and avoiding survey fatigue, disruption to local communities, or unethical control groups are major issues (McCreless 2015).
- **Different needs of businesses and donors:** While companies may have business reasons to track their own social performance, they generally do not need the same rigor that donors require. That they contribute to positive outcome is good to know, whereas donors may want quantification, causality and the counterfactual. Doing this in a reliable way is expensive, requires extensive business and community engagement, and may generate tensions between businesses and funders.

Data Collection and Use

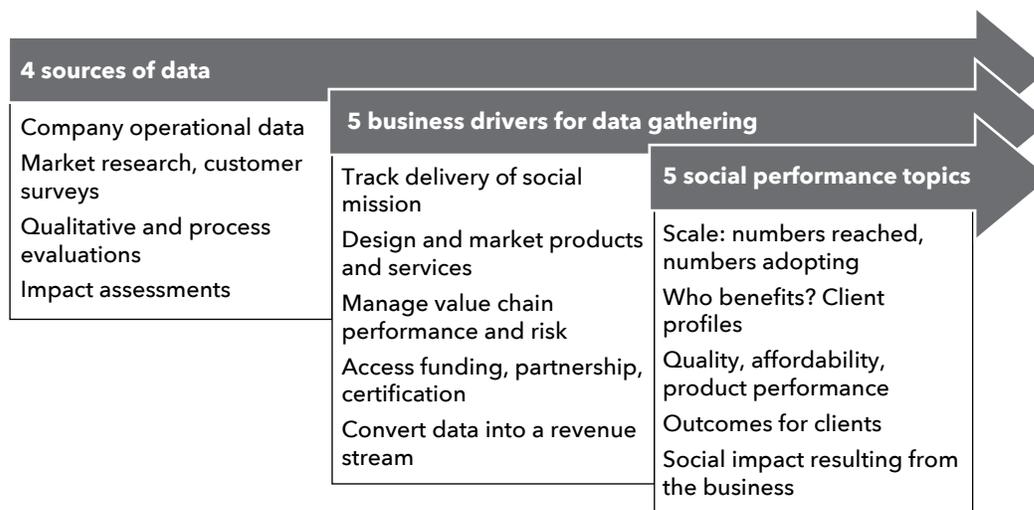
Innovative businesses, by their nature, operate in areas where evidence of results and impact are currently patchy. However, data can be central to improving business operations and to securing socially focused finance or support. Drawing on experience across all sectors covered in the series of papers on inclusive innovations, this paper maps (figure 29):

- Four main sources of data relating to business performance and impact.
- Five main drivers for businesses to gather and use data on social performance.
- Five broad areas relating to social performance and impact that can be addressed by such data, with comments on relevance and limitations of available data.

Four main sources of data

The four main sources of evidence about social performance of businesses serving low-income clients are:

Figure 29. Summary of data sources, drivers, and social performance topics covered



Source: Ashley and Shamash 2015a.

- **Company operational data**—typically on company inputs, processes and outputs such as volume of sales and quality and affordability measures.
- **Company market research**—use of tailored customer surveys and mechanisms for gathering customer feedback while delivering after-sales care, and standardized tools such as the Progress out of Poverty Index (PPI) and the USAID’s Poverty Assessment Tools.
- **Qualitative and process evaluations**—evaluations often done with or by partners/donors usually as a lesson-learning exercise. Qualitative evaluations may shed light on causal links between a business and observed social outcomes, albeit without quantification.
- **Impact assessments**—to quantify the actual impact that may be attributed to an intervention by assessing against the “counterfactual”—what would have happened without the intervention. Impact assessments may be Randomized Control Trials (RCTs), or other quasi-experimental models, usually conducted by external, independent researchers.

The first two of these are largely generated by businesses themselves, if the business case warrants it, whereas the latter two are more frequently driven by external agents. The level and nature of data that the business itself can generate depends on the business model—whether it needs data on social performance data (see next section on drivers), and also whether it has the customer engagement mechanism that can readily generate data (Ashley and Shamash 2015b).

Five main drivers of data gathering

There are five main drivers for businesses to collect information relating to social performance. It is important for social investors, donors or researchers to understand these drivers, as they indicate what might be collected routinely as part of good business, what might be tolerable to a business, and what extra social impact assessment is a burden on a business. Often data collected by a business for one purpose, such as risk management, can also be used for an element of social performance assessment. However, drivers will vary considerably by type of business and cannot be applied to all.

Direct or indirect engagement between the business and end beneficiaries? Implications for the practice of measurement.

Companies with direct and/or multiple channels of engagement (e.g. sales, financing and aftercare; subscription services) with end beneficiaries are better positioned to gather insight on company reach and measures related to improving access to goods and services. They are more likely to have a system for unique client identification, which is a core building block of social performance data.

They are also better positioned to capture many other types of client information or feedback. Companies that reach end-users through intermediaries, or provide inputs to an end product or service (e.g., telemedicine through hospital networks; solar energy provision to schools and hospitals) often lack line of sight to the end user and may not even know how many served. However, they may be able to access more extensive data on wider outcomes (e.g. education and health), and a clearer picture of the other contributors to these outcomes.

Delivering mission

Measuring progress towards social goals is critical in and of itself for mission driven enterprises. Businesses will have different views on the extent to which social mission is self-evident because of the service they provide (e.g. health products) or the target group (e.g. smallholder farmers in low-income regions).

Designing and marketing products and services

- **Creating demand:** Health, sanitation, education and energy enterprises offer new products or services in markets where the alternative may be lower cost or free, or where populations may not recognize the value or need for such products. Providing clear, relevant and tangible value propositions for local markets is key. This is often done through client testimonials, or by providing evidence of return on investment (RoI) for customers.
- **Market research and development (R&D):** Consultation with local communities, small scale trials of products or strategies in new markets, and client feedback are important mechanisms for companies developing new and tailored products for low-income markets. Such exercises can be used to baseline local communities, establish

RoI for student finance—projecting future earnings for marketing and credit risk analysis

Employment outcomes and projected future earnings following higher education are important metrics for student finance providers, both for marketing to prospective students, and for screening loan applicants. Lumni, FINAE and other providers promote their services by projections of increased earning potential for subscribers after graduation, based either on public or university data on incomes following course completion, or on company records of previous clients. Loan eligibility is also often based on future earnings potential rather than a family's existing assets, in order to open up services to those from lower-income backgrounds.

evidence bases for specific needs that a business may address, and test and prove models on a small scale. Market research is also valuable for customer retention. Businesses often seek to recover the initial costs of establishing distribution channels by making the most of their networks to provide ongoing services and make follow-on sales of new products and services. Data collection plays an important role in identifying and responding to consumer demands.

Quality, performance and risk management

- **Managing operations and value chains:** Companies use data to manage both internal operations and ensure quality of intermediaries, franchisees or networks for product distribution and service delivery. Data gathered on quality and quantity of production of services is essential to efficient management, but also provides the basic foundations for measuring social performance. More in-depth assessment of social performance can also be leveraged to identify opportunities to improve operational efficiencies.
- **Risk management:** Consumer finance is a common mechanism for selling to low-income markets. Companies providing finance employ credit risk assessments of varying levels of sophistication in order to ensure clients do not become over-indebted and to minimize payment defaults. Credit checks typically involve an assessment of client household income, assets, and current spending habits. Depending on the level of rigor associated with credit assessments, data can also be used to assess company reach into low-income market segments, and contribution towards financial inclusion.

Replacing free with better—marketing potable water based on community feedback

Providers of safe, hygienic sanitation and potable water in slums compete against a free but unsafe alternative. This places real pressure on businesses to tailor products and services to local conditions and consumer habits, and make a compelling sales pitch based on existing consumer priorities and perceptions. Sanitation providers have noted a wide range of customer priorities, indicating that a focus solely on pitching a product as having higher safety standards is not enough to secure high levels of adoption. Successful models have built services around local community consultations that gather ideas on convenience, branding, and integration of complimentary products and services.

Access to funding and public partnerships, compliance with regulation

Innovative businesses at the BoP are frequently dependent on public, donor or philanthropic capital, or are delivered through public private partnerships. They may also need to comply with regulation related to their sector (e.g. health product licenses) or certifications (e.g. organic certification, or food safety certifications in agriculture). Gathering evidence on social reach and performance may enable them to:

- Secure and retain a license to operate, or qualify for public programs, such as state subsidization of tuition fees through school vouchers, or access to national health insurance.
- Make a compelling case to grant funders or impact investors that they tackle social or environmental issues.
- Access results-based finance, such as carbon credits, which requires robust data.

Data as a revenue stream

In areas where there is a paucity of market information, good data can be a valuable commodity. While examples of businesses selling proprietary data generated through their core activities are currently scarce, access to new market information is noted as an important incentive for attracting larger corporates to partner on social enterprise initiatives. Water and sanitation initiatives, for example, often partner utility companies with community based organizations to deliver potable water in areas where traditional utility services such as piped water supply to households is commercially unfeasible or unproven. In such ‘hybrid’ models, community based organizations provide last mile distribution, while utility companies provide water and gain an opportunity to build insights into new and untapped markets.

Measuring Social Performance

Scale—Numbers reached and numbers adopting

Scale of social results is most commonly reported in terms of the number of beneficiaries reached (IRIS 2014). Number of beneficiaries may be based on unique records, or calculated using volume of transactions, average transactions, and/or rate of usage and adoption per beneficiary.

There can be considerable inconsistencies in how ‘reach’ is reported (Ashley and Shamash 2015). Some companies multiply by household size to calculate the total reached, while others do not. Some count indirect beneficiaries, for example energy companies counting customers of customers (such as patients of clinics or pupils at schools that have purchased solar energy systems). Some count all those purchasing or acquiring a product, whereas others may have data to assess actual usage.

Usage, uptake and adoption

It is unlikely that every product sold by a company is always put to full use—fortified infant food may expire, or technology may break and be left unrepaired. Small and growing businesses are unlikely to commit major resources to measuring usage levels, and may base calculations of usage on secondary research or on a very small sample of customers. Where products are subsidized or given away for free, a higher number may be distributed, but usage rates could be much lower.*

Use of smart products that can track usage is particularly widespread for energy enterprises. (See use of smart meters in World Bank 2015.) Products may track usage based on output rate, for example recording kilowatts per hour generated by a domestic solar energy system; or through motion sensor technology, tracking the number of times a product is turned on and off.

Where clients receive a service, for example a vaccination or eye operation, measurements of usage are less of an issue. Information based services are one potential exception. While companies will know what information was provided, they may need to draw on other sources in order to judge subscriber use of information—was healthcare advice acted upon by recipients, was crop price information and advice acted on by farmers to guide their selling strategies, etc.

* Clean cookstove usage rates, for example, were found to be fairly low in projects that gave cookstoves away for free and covered costs through grant and carbon credit finance, rather than through sales revenue. By comparison companies that sell clean cookstoves through low-cost finance report high usage rates.

In order to compare the scale reported by different social enterprises, methods for calculating numbers of beneficiaries must be transparent.

Reach and Inclusion—who benefits?

For businesses with social impact goals related to inclusion and poverty reduction, understanding who is reached, and how many are poor, low-income, underserved, or female are critical measures of social performance.

Most enterprises are able to describe broadly who they reach—e.g., smallholder farmers, slum dwellers, rural residents. If the business conducts direct transactions with end beneficiaries, provides finance or ongoing services then they may have considerably more data on their client profiles. Internal analysis of company data can provide rich insight on who is using what service and how much.

Other methods to assess reach and inclusion include:

- **Use of secondary evidence—poverty mapping, national and sub-national data sets and literature.** Products targeting smallholder farmers, for example, may reliably be benchmarked against regional data on average smallholder farmer incomes.
- **Customer or community surveys:** Customer surveys incorporating standardized tools for measuring poverty rates have been widely adopted by microfinance institutions and basic services providers, and may be used on samples of populations served by companies to segment by income level with a high degree of confidence. The Progress out of Poverty Index (Progress out of Poverty n.d.) and the USAID Poverty Assessment Tools (USAID n.d.) are two of the most frequently cited methods in use.

Data gathered through these tools may be compared to data from credit assessments to check and improve assessment accuracy.

Measuring Quality

Quality is an important indicator of relevance to BoP clients. They often compare the product or service to competitors or to standard metrics. Quality measures vary widely by sector and specific business model, as table 52 shows. Measures can be split into three broad categories:

- **Inputs and process measures as proxies for quality**—gathered through documentation and review of standard operational data. Standard proxies include numbers of trained service providers; presence of community consultation processes; product warranties and guarantees and compliance with industrial standards.
- **Customer/stakeholder satisfaction**—gathered through surveys of direct customers and/or local communities, customer complaints, after-sales touch-points with customers (such as advice and help lines), unique customer records to identify retention rates.
- **Outcomes and product performance**—may be measured through product field-testing, after-sales monitoring, peer or expert review (e.g., healthcare quality reviews by professionals) and test scores.

Table 52. Examples of quality indicators by sector

Sector	Inputs and processes	Customer and stakeholder satisfaction	Outcomes and performance metrics
Education	<ul style="list-style-type: none"> • Average class sizes, teacher absenteeism, availability of safe facilities 	<ul style="list-style-type: none"> • Student, family and teacher surveys. • Student enrollment and drop out rates. 	<ul style="list-style-type: none"> • Educational attainment—test scores compared to peers and national averages. • Industry standard diagnostics, e.g., International Reading Association Diagnostic Teaching Model (Pearson Foundation 2014). • Peer review.
Energy	<ul style="list-style-type: none"> • Numbers of trained sales staff and technicians. • Compliance with industry standards. • Product guarantees. 	<ul style="list-style-type: none"> • Customer surveys. • Rate of follow-on sales to customers. 	<ul style="list-style-type: none"> • Product lifetime. • Product energy generation and consumption rates. • Air quality in households/ workplaces using products. • Number of defective appliances, defaults and accidents.

Table 52. Examples of quality indicators by sector (continued)

Health	<ul style="list-style-type: none"> • Numbers of trained staff. • Availability of medicines in stock. • Availability of safe facilities. 	<ul style="list-style-type: none"> • Customer and provider surveys, e.g., Jacaranda maternal health clinics issue customer feedback surveys via text message alongside appointment reminders and mobile payment mechanism (Center for Health Market Innovations n.d.). 	<ul style="list-style-type: none"> • Number of successful diagnoses. • Operation success rates. • Post operation infection rates. • Peer review.
Finance	<ul style="list-style-type: none"> • Numbers of trained financial advisors. • Availability of advice and guidance. • Client credit assessments. 	<ul style="list-style-type: none"> • Rate of follow-on sales to customers. • Customer feedback through surveys 	<ul style="list-style-type: none"> • Payment default and delinquency rates, Portfolio at Risk (PAR) • Write-off ratios. • Insurance payout processing times.
Water and Sanitation	<ul style="list-style-type: none"> • Consultations with local communities. Numbers of trained sales and maintenance staff or franchisees. Compliance with industry standards. • Product guarantees. 	<ul style="list-style-type: none"> • Community surveys. 	<ul style="list-style-type: none"> • Water potability and safety standards. • Waste-based product safety and efficacy standards (e.g. Sanergy in Kenya's conversion of waste to organic fertilizer).

Measuring Affordability

Affordability measures are more consistent across sectors, and may be based on:

- Assessment of pricing for alternative products and existing consumer habits (e.g., monthly expenditure on kerosene as a benchmark for solar energy monthly fees).
- Assessment of consumer purchasing power and/or consumer incomes to inform either general or sliding scale pricing. For example, subsidization of insurance services (e.g., CADENA in Mexico) is often tiered based on the level of marginalization of a given area. Other basic services, including energy, water and sanitation may be priced at a percentage of total household income consistent with existing spending patterns in target markets or in more mature markets, e.g. water utilities as 0.8 percent of total consumption for low-income households globally (World Bank 2017). In such circumstances public data sources may be used to inform funding and pricing arrangements.
- Assessment of increase in consumer incomes over repayment lifespan, e.g. projected earnings for students post graduation to inform loan term and limits.

Measuring Impacts and Outcomes for BoP populations

The overlaps and distinctions between outcomes and impact

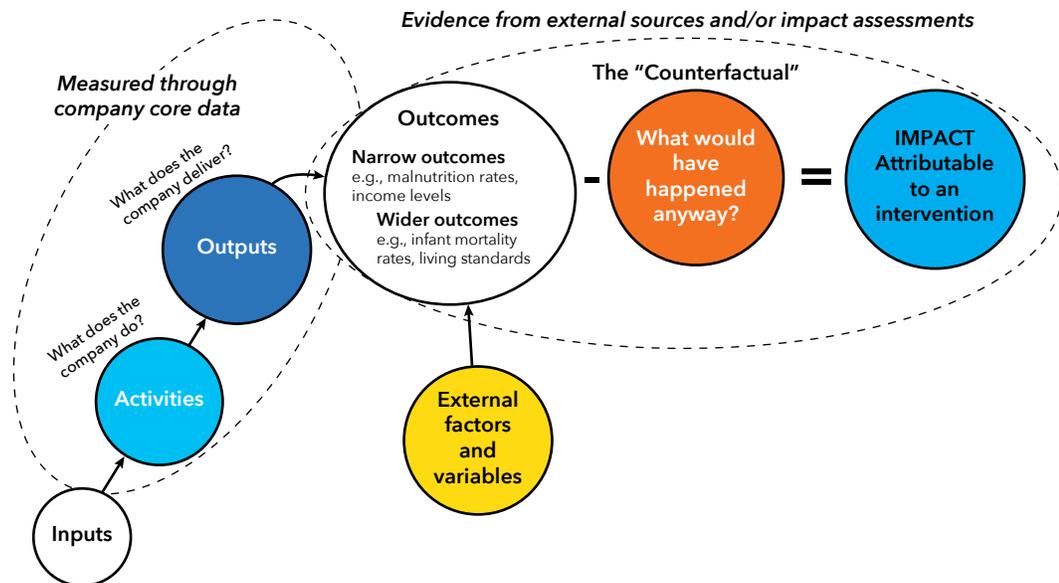
Many business track their outputs (e.g., liters of water sold in slums) and their quality (cleanliness standards) and have no reason to focus effort on understanding what happens beyond that, in terms of ‘outcomes’ (any changes in sickness rates that may be associated with their activities and a host of other variables) or ‘impact’ (the level of change that can be directly attributed to sales of potable water, given a counterfactual). They may use such terms interchangeably. Some businesses are now looking at outcomes in order to verify the performance of their business model in order to scale.

Most donors and public sector funders, and some impact investors, want to have some evidence of impact. They are more likely to distinguish between outcomes that a business may have *contributed to*, and changes for clients that can be *attributed to* a business, i.e., impact. Here we consider separately how outcomes and impact can be assessed, but recognize that definitions vary for different players, depending on where they are in the value chain and what type of player they are.

Tracking outcomes: what changes for clients and communities served by a business?

Figure 30 describes narrow outcomes and wider outcomes. Narrow outcomes may be more closely linked to a business’ activities—for example lower malnutrition rates amongst customers of a fortified infant food business, or improved crop income amongst farmers

Figure 30. From inputs to impact: The social performance value chain



Source: Ashley and Shamash 2015a.

Table 53. Examples of narrow and wider outcomes by sector

<i>Sector</i>	<i>Narrow outcomes for clients</i>	<i>Wider outcomes associated with the intervention</i>
Education	<ul style="list-style-type: none"> • Client educational attainment • Client progression into further education and employment. 	<ul style="list-style-type: none"> • Wider education system performance (e.g. state schools) • Client income levels • Client health and living standards
Energy	<ul style="list-style-type: none"> • Access to clean energy • Rates of kerosene related accidents and respiratory problems • Client time and financial savings 	<ul style="list-style-type: none"> • Client Income levels • Client health and living standards • Educational attainment for clients, and indirect beneficiaries
Finance	<ul style="list-style-type: none"> • Access to financial services • Client investment and spending trends. 	<ul style="list-style-type: none"> • Client income levels (Greatrex et al. 2015) • Living standards—family, nutrition, health, education
Health	<ul style="list-style-type: none"> • Rates of infection or disease • Rates of malnutrition 	<ul style="list-style-type: none"> • Mortality and morbidity rates in client base/local communities • Income levels in client base/local communities
Water and sanitation	<ul style="list-style-type: none"> • Access to clean water • Rates of water-borne diseases. 	<ul style="list-style-type: none"> • Mortality and morbidity rates. • Income levels in client base/local communities

receiving financial services. Wider outcomes may be one or two steps further along the chain, for example rates of infant mortality in the communities served by a fortified infant food business, or improvements in overall household income and welfare for smallholder clients of a finance or insurance provider.

Narrow outcomes targeted by social enterprises can, in some cases, be tracked through a combination of operational data (what does the company do?) plus market research (what are the local conditions, who does the company reach?). Micro-insurance companies, for example, may track “improved financial inclusion” as an outcome through a combination of metrics on insurance scheme provision to unbanked customers in low-income areas. However, in most cases, even fairly narrow assessment of outcomes requires additional work to track clients and communities after engagement.

Wider outcomes and changes in the areas targeted by an intervention are typically tracked through external data either from partners or from public research. Innovations that feed into established, broad services, for example, may be able to access data on broader outcomes (educational attainment, or mortality and morbidity rates) fairly easily, although this may depend on agreements to share data with partner organizations.

How is change measured or attributed to the innovative business?

Innovators or their partners seek to understand (and in some cases quantify) the actual, attributable impact of interventions in the following ways:

Using secondary evidence to identify links between outputs, narrow outcomes and wider outcomes, and to infer impact. Existing research on the links between outputs, immediate outcomes, and longer-term outcomes, for example studies on the links between child malnutrition and infant mortality, or between improved farmers' incomes from cash crops and improved household welfare, may be used to establish and support an intervention's theory of change. Companies are also increasingly using a small but rapidly growing body of existing Randomized Control Trial (RCT) studies on similar business models to infer similar impacts (see J-PAL n.d.).

Building insight and understanding causality through qualitative evaluations, including field observation, client and delivery agent surveys to identify links between business activities and immediate outcomes.

Qualitative studies on impact: Tracking change and building insight on causal links

Solar energy system company BBOXX installed 51 solar systems in 8 schools in Northern Uganda with funding from War Child UK. War Child conducted an evaluation (War Child UK 2014) to assess the impact of solar energy provision on education. The evaluation included:

- Comparison of test scores and enrolment rates and student and teacher retention, pre and post installation
- In-school observation
- Focus groups with school pupils and interviews with teachers and school management.

The study noted significant improvements in student enrolment and educational attainment. Focus groups, interviews and observation also identified extended study hours, greater feelings of safety at night, and improved teacher morale linked to a more reliable energy supply that could be used to power laptops and provide lighting to grade papers at night.

This assessment provides evidence of change, and qualitative evidence linking the intervention to this change. But it does not quantify the change that can be attributed directly to the installation of solar energy systems. The schools may have been on a trajectory of improvement already, and changes may also be driven by external factors, such as changes in school practice, or local school policy.

Proving and quantifying impact through RCTs or quasi-experimental methods. Given the high cost and specific skill set required for randomized evaluations, RCTs are by default delivered in partnership with grant funders and research institutions. Quantitative impact assessments focus predominantly on business models that meet the following criteria:

- **Compatibility**—innovations where engagement on multiple sites, including control sites, is achievable and ethical.
- **Research gap**—where there are current gaps in evidence that cannot be filled through secondary evidence (e.g., RCTs already conducted for similar business model innovations).

IPA and J-Pal's Six Randomized Evaluations of Microcredit

The IPA and J-Pal led program of studies covering microcredit interventions in six countries, published in January 2015, is perhaps one of the largest and most high profile recent examples of RCT evaluation in development. The six studies in Bosnia & Herzegovina, Ethiopia, India, Mexico, Mongolia and Morocco covered interventions that differed in loan terms, target borrowers, and lender characteristics. By comparing and interpreting results across these six studies, the researchers were able to draw out overarching implications on the effects of microcredit. All studies found some evidence that micro entrepreneurs were able to expand their business activity having accessed microcredit. However, small, short term loans were generally not found to lead to increased income, women's empowerment, or other measures of poverty alleviation such as child schooling. At a very simplified level, these findings suggest that standard microcredit on its own is not transformative for poor and low-income people, and therefore more innovative, flexible and multi-pronged credit and savings services should be explored by researchers, policymakers and businesses (Banerjee, Karlan, and Zinman 2015).

- **Broader applicability of research questions**—where research findings may be of use more broadly to policymakers, businesses, NGOs and other stakeholders.

Interpreting impact assessments

Randomized evaluations can be highly complex studies, and findings are rarely simple and straightforward. A 'zero effect' measured through an RCT could mean the theory of change of an intervention is disproved, that there was an implementation flaw in the intervention, or that the impact occurs in an unexpected area that has not been studied.

While some impact assessment findings may be transferable (e.g. providing affordable insurance to smallholder farmers leads to greater tolerance of risk and influences farmer investment decisions [Cole, Gine, and Vickery 2014]), many are often highly context specific (e.g., the influence on farmer investment decisions leads to improved incomes but only when combined with several other variables, such as farmer demographic profile, availability of reliable market information for farmers, agricultural extension, financial education).

Assessing impacts on direct beneficiaries vs. wider knock-on effects

While it may be in business interests to track longer-term outcomes and impact for customers, wider assessments of systemic impact (e.g., a chain school impact on state education provision (Muralidharan and Sundararaman 2015); a women's health clinic franchise impact on public health services and competitors) are likely to be of greater interest to policymakers and funders. Some may be relatively easy to track, such as wider adoptions of technologies and practices pioneered through an intervention. But wider systemic impacts, for example healthcare quality in competitors and state institutions, are subject to a wider range of variables, making inferences from existing research a greater challenge.

A randomized evaluation on school voucher programs in Andhra Pradesh by Karthik & Sundararaman (2014) assessed the spillover effects of financing students to attend private schools on local state systems. The study found little or no evidence of negative impacts. This study may be of interest to funders considering supporting chain schools and seeking assurance that the initiative will 'do no harm'. However, the absence of negative impact relates to affordable private schools operating within a *lottery-based school voucher system*. In other policy conditions, impacts may be significantly different.

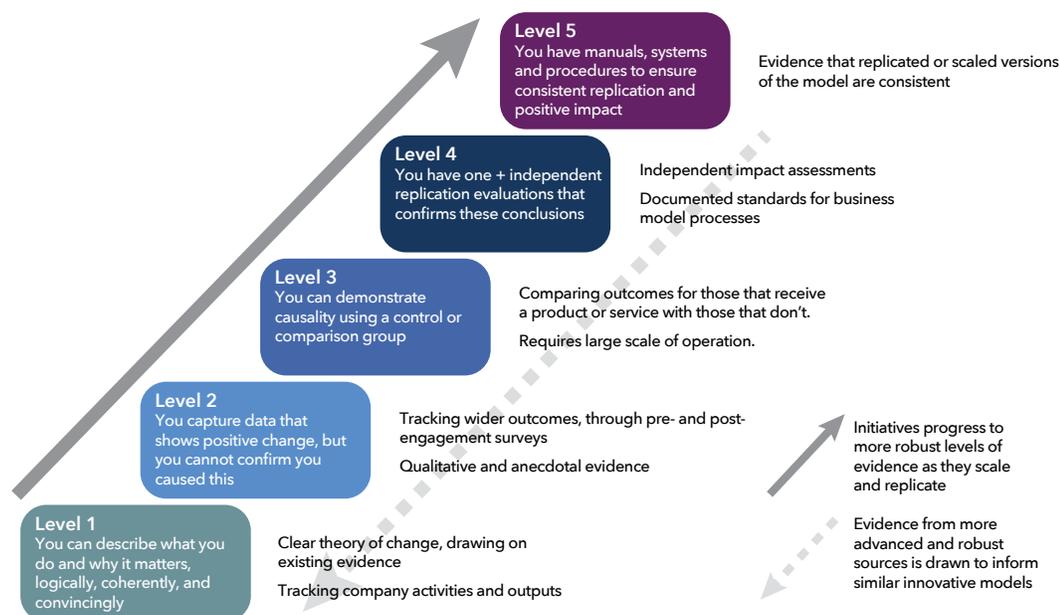
Standards and Spectrums for Measurement and Use of Evidence

There are several widely referenced standards for evidence relating to business models that target innovations for positive social change, including Nesta’s standards of evidence for Impact Investing (Puttick and Ludlow 2012); the ISEAL alliance impacts code (ISEAL 2014); the DCED standards for results measurement (Donor Committee for Enterprise Development 2014); plus several sector specific frameworks (see figure 31). They are targeted at different audiences amongst donors, researchers and businesses. Most provide guidance on ensuring ethical, robust and consistent collection of evidence, and, importantly, guidance on making good use of this evidence for management and investment decisions.

These standards also provide gradations of rigor. While ‘good’ or ‘best’ practice is typically associated with the most robust methods—such as evidence from randomized evaluations and from multiple sources—the appropriate level of evidence will depend on the type and stage of business model.

Getting social performance measurement ‘just right’ (Gugerty and Karlan 2014). The Innovations for Poverty Action (IPA) research network conducts a large number of impact assessments for BoP focused business models. Acknowledging that resource intensive randomized evaluations are not for everyone, the IPA launched the Goldilocks Project in 2014, setting out guidance for organizations to identify ‘right-fit’ approaches to measurement, and stressing two main cases where RCTs should not be conducted: i) when evidence already exists, and ii) when generating evidence on impact is simply impossible to do well.

Figure 31. Nesta standards of evidence



Source: Adapted from Puttick and Ludlow 2012.

Gugerty and Karlan also identify four “CART” principles to help organizations find the right fit in monitoring & evaluation.

- **Credible:** Only collect data that accurately reflects what you are intending to measure.
- **Actionable:** Only collect data that your organization is going to use. To make data actionable, ask if you can use the information to change the course of action at your organization—if not, do not collect it.
- **Responsible:** Match data collection with the systems and resources your organization has to collect it. Think about the resources you have. Don’t overreach, as doing so could compromise data quality.
- **Transportable:** Apply what you learn to other programs and contexts—either your own program in future years or in other locations, or those of other organizations working on similar problems.

Implications for Government and Public Financers of Innovative Businesses

When considering the evidence base for any specific innovative business model, there is a set of key questions to consider.

- Does the business model have a clear theory of change with supporting evidence from other sources? If not, identifying the relevant evidence will be difficult.
- Is the model for gathering evidence compatible with the business? Is data collection likely to inhibit the performance and competitiveness of the business?
- Is the system for collecting and using data efficient? Is existing company data sufficiently well utilized for drawing out proxies of social performance? Does the system make the most of opportunities for data collection from regular touch-points with communities and partners? Is all data collected analyzed and shared back with business operations? Are data or assumptions from similar businesses used?
- Are assumptions and methods for measurement transparent? Are the assumptions, proxies and calculations clear and rational?
- Are the implications and limitations of evidence clear? Is the data addressing attribution? When using evidence from other sources, are additional variables and differences acknowledged?
- Does research and performance measurement take account of all stakeholders? Have participants been considered and consulted in research or measurement design? Do studies balance informational needs of business and policymakers?
- Is evidence used by stakeholders? If evidence is not used, it is effectively useless. What changes as a result of measurement? What, and who is the evidence for?

When considering actions that can be taken to support development of a strong evidence base on innovative business models, three priorities emerge:

- 1) **Understand the different data needs of businesses themselves and those allocating public or philanthropic resources.** Much evidence of outcome and impact goes beyond what a competitive business can be expected to deliver; so public funds need to take the burden.
- 2) **There is considerable innovation happening in the field.** Support to speed up exchange of innovation and adoption of good practice can be useful. The Kopernick Impact Tracker Tech Catalog is one such useful example, providing an online resource that maps out and compares innovative technologies for social performance measurement (Kopernick n.d.).
- 3) **Scope for efficiencies needs to be explored.** Data can serve multiple uses, both within a business and across businesses. Data from government programs can provide proxy data for businesses if it is made available. However, care needs to be taken when applying evidence from one business to another with an apparently similar model.

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SCALING IMPACT

Role of Governments and Public Policy in Advancing Inclusive Service Delivery Models

Policy instruments help to create a conducive market ecosystem for social enterprises

HIGHLIGHTS

- Governments can use certain policy instruments to support SEs in delivering goods and services to the very poor in the areas of education, energy, healthcare, water and sanitation and finance.
- Examples of support include fostering learning and knowledge exchange, advancing policy innovations and providing financial assistance and program implementation.



Introduction

Overview

In developing countries, major gaps persist in the delivery of basic services to low-income populations. Many people still lack access to education, energy, healthcare, water and sanitation, and financial services.

Governments struggle to fill these gaps, constrained not only by the lack of fiscal resources, but also by the technical challenge of meeting the needs of low-income households, which are often also the most marginalized, disparate, and/or informal. Given the challenges and costs of meeting these needs, public sector interest is growing on whether and how to support non-state actors who may have approaches that are more effective and cost-efficient.

Social enterprises are demonstrating their ability to fill some of these gaps in service delivery. Social enterprises are privately owned organizations—either for-profit, non-profit, or a hybrid of the two—that use business methods to advance their social objectives. They focus on maximizing the social and environmental impact for their target beneficiaries in contrast of maximizing the short-term profits for their shareholders and private owners. Due to their strong presence and understanding of local communities, social enterprises are often able to reach underserved populations through flexible and innovative business models.

However, low-income settings present numerous constraints for social enterprises. These challenges create entry barriers for social enterprises and limit the ability of low-income groups to participate in their services. There are four main areas of constraints that social enterprises most often face in these settings: information and awareness, rules and regulations, financial resources, and structure and capacity. Each of these can be addressed and alleviated, to some extent, by policy interventions.

While not extensive, this paper introduces 10 key instruments that governments can use to support social enterprises that serve markets at the Bottom of the Pyramid (BoP) in the five sectors mentioned above. The repertoire of policy instruments ranges from overarching policy frameworks to being an active partner of social enterprises. The choice of the most effective tool depends on the enabling environment and the options available. Often, combinations of instruments are required to address multiple constraints.

The World Bank and development organizations play an important role in supporting governments to strengthen the ecosystem for social enterprises through fostering learning and knowledge exchange, advancing policy innovations, providing financial assistance and program implementation, as well as capacity building.

Methodology

To prepare this chapter, we studied a database of 290 social enterprises that deliver goods and services in low-income markets. These social enterprises were further classified into 26 business model innovations across five sectors, education, energy, financial services, healthcare, and water and sanitation. We looked at each of these individual business model innovations to study patterns in the role of the public sector and policies. Both primary and secondary sources were used for the research. We interviewed a set of social enterprises from each of the business model innovations to better understand their operations in low-income markets. We also conducted interviews with sector experts to sharpen the sector-level understanding and gain a perspective on trends and patterns.

This chapter also takes into account previous findings on the role of governments in enabling private participation in low-income markets. The literature referred to includes *Inclusive Business Policies* published by Endeava in 2013 and the *G20 Note on Inclusive Business Policies* published in 2013.

Why and How Governments Support Service Delivery by Social Enterprises

Governments often cannot deliver public services to the BoP

People living at the BoP often lack access to essential goods and services such as healthcare, education, energy, water and sanitation, and hygiene. Governments, for a number of reasons, including lack of resources and capacity, are often unable to effectively reach rural villages and urban slums with public services. Access to healthcare services remains highly uneven, access to schooling has increased but with enduring constraints on quality and attendance, access to sanitation barely appears on the radar in many countries, while extension of electrification has left large swathes of the population in most low-income countries untouched. Financial services for the unbanked have developed fairly rapidly in recent decades, but led by NGOs and social enterprises rather than through roll-out by governments.

At the same time, markets for these goods and services are often non-existent or under-developed, due to the lack of an enabling market environment. Hence, there is growing interest among governments in whether innovative models developed by social enterprises can improve service delivery to the BoP and whether governments can and should do more to support them.

Social enterprises fill the service delivery gap in many places

Social enterprises can be of interest to policy makers for a number of reasons:

- While they remain small, they demonstrate continued potential to scale.
- The models focus strongly on innovation in design and delivery to meet the needs of the BoP and overcome some of the challenges of serving such a market.
- Some models are intended to achieve commercial viability (e.g., solar home systems), and thus will ultimately be able to continue to scale with no public sector input.
- Some models are intended to be hybrid (e.g., water decontamination and supply), drawing on public and/or philanthropic input as well as user fees. The public input needed per user served is thus lower than in a public sector model.
- Entrepreneurs take on the costs of creating new markets, which constrains their profitability or growth. They are increasingly calling for more support in creating conducive ecosystems and public goods.
- The models are developing in new and fragmented markets, so they are highly susceptible, both positively and negatively, to policies, regulation, and value chain developments.
- There is a small but growing body of evidence that the models deliver outcomes, for example in health provision or water supply, and meeting needs that are not met by a pure public sector model. However, data to compare the costs and effectiveness of public provision, social enterprise provision, and hybrid models is not yet available.

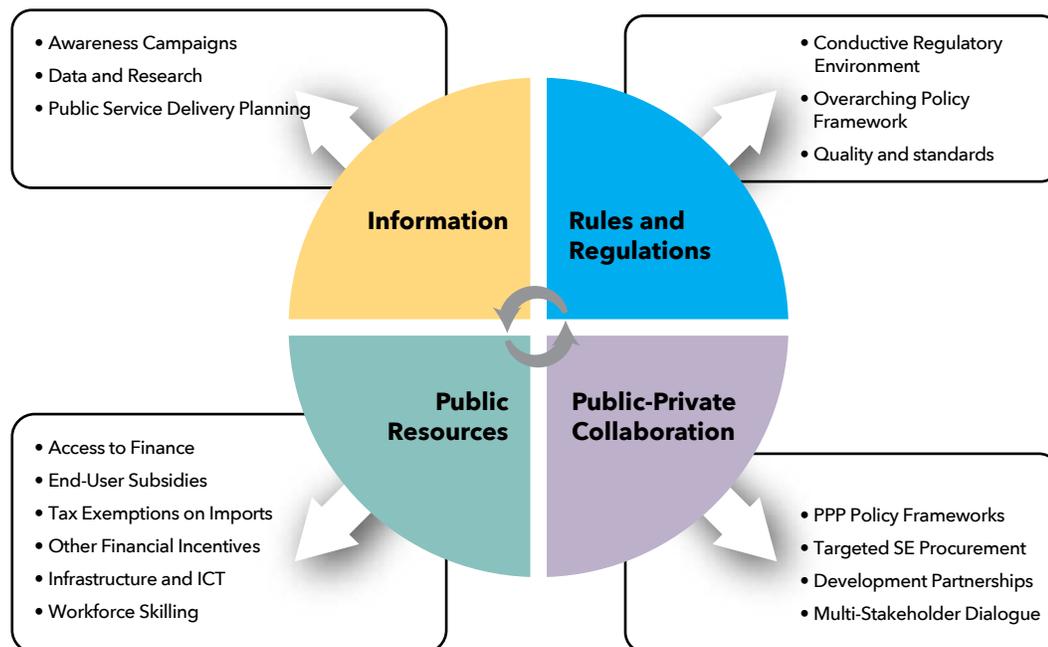
Social enterprises face challenges in BoP markets

Constraints faced by low-income populations also create challenges for social enterprises aiming to reach them. The challenges go far beyond the mere fact that poor people cannot afford to spend much for services. Infrastructure is poor, markets are fragmented, transactions are mainly informal and cash-based, and cash flow is irregular. People have limited education and access to information, and they may have no habit of either paying for them or using the services offered. Supply chains are likely to be weak, making logistics and servicing an additional challenge. These barriers drive up transaction costs and make it difficult to do business. While social enterprises can overcome some challenges through innovation and investment, the high costs related to these market-building activities regularly limit the scaling of otherwise functional models.

Government can create the conditions for success and scale

Governments can establish a conducive market environment for business through their policies. They play an important role in reducing barriers for social enterprises and can promote innovative solutions for service delivery by social enterprises. Four functions of governments can be distinguished in this regard: providing information, setting and enforcing rules and regulations, providing public resources, and collaborating with the

Figure 32. Examples of policy instruments to support social enterprises working in BoP markets



Source: Leach 2015.

private sector. Figure 32 shows examples of policy instruments that have been identified for each function.

In addition to these individual functions, the overall narrative on the role of social enterprises for service delivery is set by government. Is social policy and economic policy deemed to be entirely separate? Are social enterprises included in the dialogue on regional or social development? Are social impacts of businesses recognized? By acknowledging the contribution of social enterprises to sustainable and human development, government encourages innovation and entrepreneurship.

Policy support varies greatly by sector

Health and education are traditionally the domain of government provision. These sectors are not only heavily regulated, but the role of private providers is often constrained or not acknowledged. When governments integrate social enterprises in BoP service delivery, they often use collaborative approaches and provide financial support to make models viable. Close alignment with public standards is critical. Energy and water and sanitation are also heavily regulated sectors when it comes to formal provision of services, especially on the grid.

However, most service provision to low-income households is traditionally taken care of by off-grid solutions offered by informal players (e.g., selling candles, charcoal or kerosene, selling bottled water, emptying latrines). To advance access to improved solutions, governments create regulation that acknowledges off-grid providers and facilitates licensing processes. They also create incentives via awareness campaigns, end-user subsidies, or tax breaks. Of course, these high-level patterns are much more nuanced if one takes a more detailed look, and all instruments can in principle be applied to all sectors.

Policy is enacted at all levels of government

The range of policy instruments used by governments extends from overarching policies that set broad development goals to more granular sector regulations directly affecting the daily operations of a social enterprise. The nature of the policy instrument determines which level of government is involved and how roles and responsibilities are divided. On the national level, overarching policy frameworks such as poverty-reduction strategies or national development plans define broad government visions and help establish priorities for action. Local- and municipal-level authorities, which are closer to the ground, support implementation of solutions operationally, such as providing land for sanitation facilities.

Innovation in the model of social enterprises is often driven by collaboration across sectors: energy and finance, health and technology, and housing and sanitation. For example, a stove business can be constrained by regulations on slum housing, or an energy business by regulations on mobile finance, or a technology company by regulations on health provision. Often, policies relevant to BoP service delivery cut across multiple government entities (several ministries, regional and local administrations, local authorities). This requires close coordination, and continuous and open dialogue between all government entities involved throughout the policy cycle. It calls for innovative approaches on the part of policy makers,

cutting through established boundaries and government departments. For example, mobile money has regulatory implications in both the financial and Information Communication Technology (ICT) sectors. Similarly, improving access to healthcare for informal sector workers requires the involvement of both the health and labor departments.

The next four sections introduce key instruments per function and explain how they are used in different sectors.

Policy Instrument: Information

Governments play a vital role in collecting and disseminating information

Governments possess a vast amount of information from various stakeholders for their own policy making purposes. This puts governments in a vital position to collect and disseminate information and also generate knowledge through research.

Policy instruments that facilitate the creation, availability, and exchange of information create conducive conditions for the social enterprises to enter low-income markets. Through these tools, social enterprises can develop a better understanding of low-income markets and develop better suited models, and low-income people can make better choices related to services.

Two instruments have been identified: building awareness among consumers and providing data and research on BoP markets.

Building Awareness Among Consumers

Poor people often lack access to information on available services and their benefits, as well as on the negative consequences of current consumer choices (such as drinking contaminated water). When governments raise awareness, they create a fertile ground for SE service delivery by creating trust in, and demand for, the service offering. While evidence in our database on this government contribution is limited, researchers often identify awareness-raising as an important role for governments to strengthen social enterprise ecosystems.

Energy: To avoid energy theft on the grid and increase consumers' willingness to pay, governments raise awareness among low-income consumers that energy is a purchased product and not free. This understanding is critical to enable grid-connection service delivery, whether it be private or public.

Healthcare: Pregnant women need to learn about prenatal care and children need to learn about basic preventive healthcare. Governments often run campaigns to educate communities on the benefits of proper healthcare, thereby strengthening the market for healthcare products. In India, the government invests in raising awareness about the benefits of the national health insurance scheme, Rashtriya Swasthya Bima Yojna (RSBY), to provide access to healthcare services to people living below the poverty line. The usage rates of RSBY

increased when membership cards were issued immediately upon enrollment and clients were informed about how to make the insurance claim.

Water and sanitation: Governments fund education activities for health officers, trainers, and villagers to promote hygiene and raise awareness about reasons for using toilets or hand hygiene. Quite often these activities are carried out in tandem with healthcare initiatives. For example, Ecofiltro in Guatemala works with local governments to educate communities about the dangers of unsafe water and ways to avoid them.

Data and Research on BoP Markets

Governments own a wealth of data gathered through administrative processes, household surveys, etc. This data can be valuable for social enterprises that aim to understand market gaps and customer profiles. Government expansion plans are also critical to share, since this affects rates of return on projects such as off-grid energy systems or water and sanitation services.

Education: The government collects and publishes data pertaining to student enrollments, educational achievements, and teaching staff. Such data is extremely important for social enterprises to set educational objectives and design appropriate models. In Uganda and South Africa, the Ministry of Education and its local departments assist the social enterprises Hands-on-Tech and Limited Resource Teacher Training in identifying and selecting the most suitable schools for providing their teacher training. In India, the State Institute of Education in Goa supported teacher training provider Karadi Path by conducting a study on the methodology's effectiveness in 20 schools.

Financial services: Innovative financial services that reach the BoP often rely on solid technical infrastructure. For example, to enable the provision of index-based agri-insurance services, governments invest in weather stations and other measurement technology that entails a high initial investment. These costs are commonly borne by governments or international donors.

Healthcare: Governments collect and maintain data on several health parameters, such as the prevalence of diseases, causes of death, and available health infrastructure across the country. This data points at the most urgent needs within the overall healthcare sector, including personnel gaps and reach of healthcare services, and guides policy goals and innovation. Governments can also promote research institutes or universities to undertake research into national health priorities.

Energy: Governments can also support businesses by providing relevant market contacts and information on their electrification plans. For example, the government of Rwanda shared its grid extension strategy with Mobisol to guarantee the most effective electrification coverage. It shares grid maps with the company and facilitates entry into communities by providing contacts at the village level.

Water and sanitation: Facilitating knowledge sharing and discussion is another way in which governments can play a role. For example, in 2014, the Ugandan government supported the first national conference on menstrual hygiene, which focused on breaking the taboo of menstruation and keeping girls in school. The social enterprise AFRIPads was part of the consortium of civil society organizations that organized the conference in collaboration with various ministries, including Health, Education and Sports; Gender, Labour and Social Development; and the Ministry of Water and Environment (AFRIPads n.d.).

Policy Instrument: Rules and Regulations

Low-income markets are marked by informality and regulatory entry barriers

Low-income people predominantly operate in the informal sector of the economy. For instance, the retail trade in Kenya is 95 percent informal (Kubzansky, Cooper, and Barbary 2011), and formal distribution channels might not even reach the poor due to remote locations and inadequate infrastructure. Further, low-income groups' access to banks and financial institutions, as well as main electricity grids even when available, is often restricted due to lack of proper identity documentation. To integrate these groups into formal value chains, social enterprises require a supportive set of rules and regulations.

Burdensome or outdated regulation can preclude the entry of innovative solutions into a market. In the case of education, some regulations do not specify the private sector's role, or impose unclear registration criteria for private schools. Restrictions on the legal forms and operating freedom of private schools and infrastructural requirements have inhibited private sector participation in some countries.

Conducive rules help with inclusion of low-income groups in formal value chains

Governments are the only actors that have the authority to create and implement binding regulations for all societal actors and impose sanctions in case of non-compliance. They do so through their legislative and administrative bodies, and public services, and have several instruments at their disposal to enable and encourage social enterprises and empower low-income people.

The most commonly used policy instruments in the reviewed cases include sector regulations, and standards and accreditation. Often, these regulations follow the successful and widespread adoption of innovative delivery models by social enterprises, and have to undergo an evolutionary process. In the cases of microcredit, micro-insurance, mobile banking, and off-grid energy provision, among others, regulation was developed only after these innovations reached a critical mass.

Sector Strategies and Regulation

Sector regulation creates the legal basis for social enterprises to enter the market and build businesses, either by creating new regulations for new industries or by relaxing or adjusting existing regulations that reduce the barriers for entry and subsequent operations. They also create a framework for action by formulating policy objectives and plans. In some cases, new regulations have also been enacted to encourage private participation in delivery of essential services to low-income groups.

Energy: Governments set the framework that enables social enterprises to contribute to electrification. A clear government strategy that acknowledges the role of private providers and gives direction allows social enterprises to define a business case and areas for intervention. For example, the government of Tanzania clearly specified which areas of the country the grid and off-grid solutions would cover, and then invited the private sector to provide these solutions. In Bulgaria, India, and several other countries, slum electrification innovations were crafted after the privatization of state distribution companies. The newly privatized companies also received the leeway to design solutions that were more suited for the low-income setting. In India, solutions such as solar mini-grids and solar home systems received a boost due to the government renewable energy policy, which acknowledges and promotes the role of private providers.

Water and sanitation: A national commitment to sanitation backed by a policy on sanitation programs and clear responsibility for implementation in a single government agency, specifically at the local levels, is one of the major determinants of success in this sector. In Colombia, Law 99 of 1993 established a water and sanitation sector framework that allows social enterprises to expand coverage in poor municipalities not effectively served by traditional public utilities.

Education: Education is a highly regulated sector. Recognizing the role of social enterprises is already an important step to create the ground for investment and formal providers. Overarching policy frameworks have important effects on the demand for private education services. Abolition of school fees in many countries have led to an influx of students, which has not been matched by adequate investments and increases in teachers. Over 70 percent of sub-Saharan African countries have acute teacher shortages (UNESCO 2014). Under-resourced, overcrowded schools, and low quality of public education encourages low-income parents to seek alternatives in the private sector. Bangladesh has seen similar impacts since public school fees were abolished, prompting BRAC to establish Shishu Niketan schools where public schooling has deteriorated (Nahid and Nath 2014).

Financial services: Attempts to avoid money laundering, prevent illicit financial transactions, and protect citizens from financial harm have kept financial services a highly regulated sector, and often also highly politicized. In Africa, the lack of regulation enabled mobile money providers such as M-PESA to grow quickly, while tight regulations in Asia prevented similar success (see case study 1). In India, Vodafone had to wait a few years for regulation on mobile wallets to be put in place before it was given a license to operate. Though at times a bottleneck, government regulations have evolved in some cases to provide enabling

platforms for financial innovation targeted at low-income people. For instance, in the case of agri-insurance, well-specified legal frameworks have defined insurance companies' field of activities, guaranteed their financial integrity, and inspired confidence in all of the actors involved. Consumer and entrepreneur finance models have not seen high involvement of governments, which have largely remained on the sidelines.

Healthcare: The health sector needs sufficient oversight and regulation of private providers and products to protect patient safety and outcomes. It is influenced by the government through a mix of instruments ranging from overarching health policy objectives to granular sector regulations that can facilitate the emergence of social enterprises. Private franchise networks of reproductive health service providers are regulated by registration requirements as well as legal provisions for franchising, procurement of drugs, commodities and supplies by private actors, and accreditation. In the case of telemedicine, legislation is crucial to protect sensitive personal and health-related data in digital formats, as well as allowing individuals the right to access and control over their own health records. A legal framework that requires insurance companies to officially recognize telemedicine and reimburse doctors for its use is also critical for its success. Policy and regulation can serve to harmonize the roles and responsibilities of community health workers and provide clear standards and protocols to ensure quality.

Standards and Accreditation

Standards help ensure low-income consumers get value for their money. Where standards are lacking, low-quality competition can erode consumers' trust in the entire sector, as has been seen with solar lighting products. Accreditation schemes can improve the reputation of social enterprises and weed out bad performers.

Education: Standards and accreditation are critical to align private provision of education services with public expectations. Governments establish indicators of school quality and improvement that guide providers' solutions. These standards also guide education provision in private schools, and school evaluations provide important information for parents choosing a school for their children. Some social enterprises, such as Link in various countries in Africa, support school evaluation through school performance reviews that align with national standards. Learning centers often aim to reintegrate children into mainstream education, making alignment with the public education system an important success factor. The Bangladeshi government is working on an accreditation scheme for non-formal learning with formal qualifications (UNESCO 2013). Social enterprises promoting teacher quality equally require alignment with national standards. In Thailand and India, the Ministries of Education have accredited Lamplimat Pattana School and the Muktangan Schools as official teacher training programs and sites.

Healthcare: In healthcare, sufficient oversight, regulation, and enforcement of private providers and products is needed to protect patient safety and outcomes. Accreditation of healthcare professionals and providers helps to ensure patients receive quality service.

A close link with public standards can facilitate scale-up for private health providers, for example by enabling access to subsidies. Most women's health franchises, such as Merrygold in India, Bluestar in Vietnam, and Greenstar in Pakistan, link to the public sector through a common accreditation and quality oversight system.

Water and sanitation: Standards are also important to ensure safety in the provision of water and sanitation solutions. Existing sanitation initiatives often work with the respective governments on overall facilitation of the market. The Selling Sanitation Program in Kenya has supported the Ministry of Health to develop a national definition for improved sanitation, national guidelines for pit standards and latrine options, and an accreditation scheme for improved sanitation options produced by local manufacturers.

Energy: Low quality of off-grid products has hindered the scale-up of these solutions. Setting standards and accrediting products help consumers choose quality products that are worth their price. The World Bank program, Lighting Africa, develops standards and accreditation schemes for solar products in Asia and Africa.

Policy Instrument: Public Resources

Lack of affordable and ample financial resources in low-income markets

A common theme in the reviewed business models is a scarcity of financial resources, both for low-income customers and for the social enterprises catering to these markets.

Low-income people can lack the financial capacity to afford even essential goods and services. Their access to formal sources of capital is limited, and they conduct most of their economic transactions in cash. Local providers of credit such as money lenders charge high interest rates that prevent low-income groups from investing in capital-intensive solutions such as solar home systems or toilets.

Social enterprises face difficulties in financing their business startup and expansion through commercial finance. Serving low-income customers is usually associated with higher risk and uncertainty, as well as lower margins. Credit markets in developing countries are often immature, implying a high cost of capital and making credit inaccessible for social enterprises. Lack of finance restricts organizational growth and thus impact of social enterprises.

Governments fill the financing gap through various instruments

Governments disburse financial resources to incentivize companies to invest in certain activities, for example via subsidies and tax breaks. Governments also improve access to finance through public development banks that provide preferential interest rates. Public investments into infrastructure, ICT, and the workforce reduce the cost burden for social enterprises.

End-user Subsidies and Tax Breaks

End-user subsidies can help to create markets for products and services that would otherwise be unaffordable for people with low incomes. These subsidies can take the form of differentiated tariffs, cash transfers, or vouchers. Tax breaks on products are functionally equivalent. **Education:** Governments have tried to bridge the education gap through several financial instruments, such as direct subsidies, cash transfers, and capital support. The chain school LEAP receives government subsidies for deprived children, albeit only half of the subsidy allocated to public schools. Learning centers also often depend on student subsidies. Gyan Shala in India receives government reimbursements per student. Agastya's science centers and mobile science labs are supported by Sarva Shiksha Abhiyan (SSA), the Indian government's flagship program for universal access to elementary education. Agastya also has partnerships with Haryana and Karnataka state governments. Enova has leveraged the State of Mexico's digital libraries development plan to secure grants for its students.

Conditional cash transfers have been introduced in many countries to incentivize families to use basic services such as healthcare and education. In 2007, the Indonesian government launched Program Keluarga Harapan (PKH), which provides cash transfers conditional on households accessing specified health and education services, including children ages 6 to 18 attending nine-year compulsory education.

Energy: Subsidies have played an important role in promoting social enterprises that provide electricity access to the underserved. The Ministry of New and Renewable Energy in India provides subsidies of up to 30 percent of the cost of solar home systems or mini grids to the end-users. Subsidies have enabled grid-based energy distribution companies to offer differentiated tariffs to low-income households, and they reduce the cost for a new electricity connection, allowing more people to legally access electricity. In some cases, tax breaks have been used to enhance energy access to the underserved. The Tanzanian government, in addition to relaxing the entry norms for mini-grids players, also provides tax incentives and removed import duties on solar panels.

Healthcare: End-user financing is widely used for improving access to healthcare for low-income people through several different instruments. In Kenya and Uganda, the Reproductive Health Output-Based Aid Voucher Program aims to stimulate consumer interest in healthcare services. Consumers purchase vouchers at a low cost, and providers then use the voucher to receive reimbursement for treatment costs. Greenstar, the second largest provider of family planning services in Pakistan after the government, partnered with the public sector and donor agencies to implement voucher schemes that provide subsidized access to institutionalized healthcare for mothers (Greenstar n.d.). Eighty thousand vouchers are being distributed to qualifying women in the lowest wealth quintiles in Punjab and Sind (Pakistan). Voucher recipients have access to subsidized services through clinics in the Greenstar franchise network as well as to public providers.

The national health insurance scheme RSBY in India enables free access to healthcare services of up to a certain limit to the citizens living below the poverty line. In other cases, through state-funded health services, the government health agencies support health micro-

insurance schemes by reducing costs or by complementing the entitlements of clients with government health services.

Access to female hygiene products and specialized hospitals has also been facilitated through end-user subsidies or tax breaks. In 2011, Kenya stopped levying import tax on sanitary products, which led to a reduction in cost by 18 percent (New Internationalist 2013). It also allocated almost USD 4 million to provide free sanitary napkins for schoolgirls in 2011, and in 2014 committed to an additional USD 2 million (George 2014; East African Business Week 2014).^{*} In 2010, the Indian government announced the Menstrual Hygiene Scheme as part of its National Rural Health Mission, to provide highly subsidized sanitary pads to rural girls living below the poverty line. State governments—including Himachal Pradesh, Delhi, Tamil Nadu, and Bihar—have followed suit with similar initiatives.

Water and sanitation: Some governments provide targeted subsidies to reduce the price of toilets for low-income households. Evidence on outcomes is mixed. For example, eKutir in India notes that specific government guidelines on toilet set-up, materials, and products to be used have restricted its access to government subsidies. The company is engaging with the Indian government to address this issue. WaterSHED in Cambodia notes that government-led programs providing fully subsidized sanitation products at no cost to the consumer undermine its market-led approach. WaterSHED is addressing this by engaging with the national government to implement more aligned strategies, e.g., a targeted subsidy to the very poor. This is also BRAC's approach in Bangladesh, where smartly designed subsidies for poorer households work successfully (Hystra 2014). Various programs facilitate access to government sanitation subsidies for low-income households, such as Ambuja Cement Foundation and 3Si in India (Roma and Curtis 2014).

Grants and Soft Loans

Governments also support social enterprises directly through grants and soft loans. Donors also play an important role in funding social enterprises, either through national programs or international award schemes.

Education: Most of the social enterprises focused on teaching quality in our analysis receive financial contribution from the governments either in the form of grants or as payments for serving government schools. In the Philippines, local governments bear about half of the cost of rolling out BridgeIT, a teacher training program. Experifun Learning Solutions in India received funding from the Government Department of Industrial Policy & Promotion.

Healthcare: Telemedicine relies particularly on government funding, since it often requires significant investments. Government and international donors, often in collaboration,

^{*} The scope and budgets of these schemes vary, as does their success. In 2012, medical officers in Varanasi, India, reported receiving no funds to implement the scheme. In Kenya it was reported in 2013 that the budget had been slashed, and girls were resorting to alternative means.

provide seed capital for setting up the project and pay the physicians for their time.† The project Telemedicine Support to Promote Maternal and Newborn Health in Remote Provinces of Mongolia was paid for by the Mongolian government's Mother and Child Health Research Centre (MCHRC) in Ulaanbaatar, the Government of Luxembourg (Lux-Development Agency), and the United Nations Population Fund (UNFPA).

Energy: Installation of energy solutions such as solar home systems or mini grids is very capital intensive and requires low-cost consumer finance solutions. In 1997, the Bangladeshi government established the Infrastructure Development Company Limited (IDCOL), a government owned non-banking financial institution. IDCOL provides financing for the Bangladeshi Solar Home System Programme that financed installation of more than three million solar home systems in rural Bangladesh. IDCOL catalyzed the development of a local supply chain with more than three Bangladeshi-based solar panel producers, more than five local battery producers, and several local LED producers. Together with the quality standards set by the government, this led the way for the successful expansion of Grameen Shakti.

Infrastructure

Government investment in infrastructure creates a supportive ecosystem for social enterprises and reduces their cost of access. Setting up a wide telecommunication infrastructure, for instance, improves the market penetration for several new social enterprises, including mobile health and mobile money, and also brings new technologies within the reach of low-income groups. Good roads facilitate access to remote areas. Reliable electricity supply allows for continued operation of facilities, such as hospitals or offices.

Infrastructure has rarely been mentioned as a key role of governments to facilitate individual service delivery models, but can be seen as a generic enabler across the spectrum. Some models build on close collaboration with the public sector, such as teacher training or telemedicine. Here, social enterprises usually enter into dialogue with governments about the necessary infrastructure prerequisites for collaborating with specific institutions.

Policy Instrument: Public-Private Collaboration

Governments and social enterprises often need to collaborate to close service delivery gaps

Governments have a mandate to provide essential goods and services to the whole population. It can leverage the creativity of social enterprises to reach currently underserved communities. At the same time, social enterprises can build on existing public structures to reach out to their target group, and work with public institutions to improve the quality of

† Insurance schemes usually won't reimburse a doctor or patient for telemedicine because it's not legitimate in the eyes of policy. The state must sometimes step in to reimburse the doctor.

provision. Public-private collaboration can thus be a recipe for broad-based scale-up, especially where social enterprise and public programs are aligned.

Even though the boundaries between them can be blurry, three instruments can be distinguished: development partnerships, public procurement of social enterprise services, and aligning social enterprises and government programs.

Development Partnerships

In development partnerships, public and private sector partners each contribute complementary capabilities in the implementation of a project that creates benefits for both parties. This can include classic public-private partnership models and policies.

Education: Social enterprises have been able to build on public sector outreach and resources and enhance the quality of education. In the contract schooling model, government-funded schools are managed by private sector education enterprises. This is an established public-private partnership model in Latin America. Governments also partner with social enterprises to evaluate school performance. Here, Memorandums of Understanding define expectations, goals, and cancellation terms, and may mandate participation of education officials. The government acts as regulator and enforcer but also in some cases, such as the social enterprises Link and JET, provides in-kind support that covers some project expenses. Teacher training is another area where collaboration between public and private sector is beginning to emerge. In India, the STIR education model is partly embedded into the public teacher training system. In the Philippines, Bridge IT trains education officers to implement and mainstream its teacher training program.

Energy: In the energy sector, development partnerships have been employed in particular to connect urban slums to the main grid. The initiatives have largely originated after privatization of the erstwhile public electricity distribution companies. The privatized providers sometimes undertake slum electrification programs voluntarily to reduce power theft, and sometimes due to a public mandate for inclusion of low-income groups. The success of the partnership also rests on back-end infrastructure upgrades—power generation, electricity transmission and distribution infrastructure—which typically rely on some degree of government financing.

Financial services: Public-private partnership models have been used for agri-insurance, such as in India and Mexico. Government subsidizes a significant part of the premiums while a private insurer underwrites the risk.

Water and sanitation: Several small and grassroots level initiatives have entered into partnerships with governments to deliver water and sanitation goods and services. Ecotact in Kenya offers sanitation services with its IkoToilets: it enters into long-term contracts with municipalities that provide public land to build facilities. Ecotact covers the cost of constructing the facilities on municipal land, runs them on a commercial basis for five years to recover the investment, and then turns the facilities over to the municipal council to run or leases them back to a private sector partner. Similar models exist for bringing

safe and affordable drinking water to urban households without access to piped utility water supplies. In Antananarivo, Madagascar, the cost of building water kiosks in areas without access to utilities are shared by the government and the kiosks are subsequently managed by local organizations.

Procuring from social enterprises

Governments can also procure services from social enterprises, paying them directly for service provision. This approach is often used to expand provision of health and water and sanitation services. Government procurement can create a boost for new social enterprise models. Close alignment with existing public guidelines and regulations is a must.

Healthcare: Governments can source innovations from social enterprises. The Kenyan government has contracted the NGO Mary Stopes International to set up AMUA. AMUA is a social enterprise that consists of more than 270 privately owned and operated clinics that focus primarily on providing reproductive health and family planning programs and maternal and child health services. In India, the Ministry of Labor and Employment launched RSBY as a public health insurance scheme to provide social protection to low-income households. It works with private risk carriers, insurance administrators, and hospitals to implement the program.

Water and sanitation: Market facilitator organizations have also been contracted to implement government sanitation programs. Gramayala in India is one of 14 NGOs that implement the government's Total Sanitation Campaign while also acting as implementation partner for the NGO WaterAid India.

Aligning with Government Programs

Collaboration also happens where social enterprises and government programs align their activities. Governments may take up innovations by social enterprises and mainstream them through their own programming. Or, vice versa, social enterprises may harmonize their procedures with public programs, and this enables close collaboration. Alignment can, but does not need to be, formalized by Memorandums of Understanding or other partnership documentation.

Education: Governments have adopted social enterprise innovations and mainstreamed them across the system. Some governments have replicated learning center models and methods. AIL's pre-school program is now the model for Afghanistan and AIL has trained over 21,000 teachers reaching 3.5 million students (Skoll Foundation n.d.). Escuela Nueva's learning circles program, which educates displaced children who are officially enrolled in public schools, was adopted as a national policy by the Colombian government.

Governments have also adopted school evaluation and improvement solutions. The Ugandan government's Monitoring Learner Assessment is an adaptation of Link's School Performance Review. Malawi is also developing its own version. GMSA Foundation's

school self-evaluation instrument and database have been adopted by the South African authorities and piloted in over 350 schools. Fundación Chile's online self-evaluation tool has been adopted by the Chilean government and used by 37 percent of urban Chilean schools as of 2013.

Healthcare: Alignment and harmonization with the national health system is often a prerequisite for scale. For example, Tunza's clinical guidelines and protocols employed are firmly based on Kenyan government and WHO protocols, and Tunza regularly shares data with the government. Marie Stopes International has assisted the governments of Vietnam and China in applying franchising principles to the public sector, standardizing services, refurbishing facilities, and training employees.

Community health worker (CHW) programs must be aligned with national health systems and ensure feedback loops between CHWs and local health facilities. Links between CHWs and higher levels of the health system are therefore key. These links include mentoring and supervision of CHWs by doctors and nurses at local health facilities. In Uganda, Living Goods works closely with District Health Teams who engage in recruitment and interviews, quarterly supervision exercises, and oversight of the Living Goods' CHWs. Living Goods has also made an effort to conscript and support pre-trained government CHWs where they are available, interested, and meet its standards. As a result, in Uganda, more than a third of Living Goods' existing CHWs are government-trained.

			<p>CASE STUDY</p> <h2>Providing Banking to the Unbanked in Kenya through Mobile Phones</h2>		
<p>LOCATION Kenya</p>	<p>IMPACT SECTOR Financial inclusion</p>	<p>KEY ACTORS Mobile network operators, banks, Central Bank of Kenya (CBK), Communications Commission of Kenya</p>			
<p>POLICY INSTRUMENT TYPE Rules</p>	<p>POLICY TOOLS Regulatory framework</p>				

Many of the products and services offered by traditional financial institutions are ill adapted to the needs and conditions of the low-income population. In Kenya, this meant that only 26.4 percent of the adult population had access to financial services in 2006. However, by 2013 the proportion increased to over 65 percent (GSMA 2015). This has been made possible in part due to the evolution of mobile money, which has enabled anyone with a mobile phone to perform basic financial transactions without having to use a bank account or rely on riskier, less efficient methods, such as delivering cash in person.

In 2007, Safaricom started offering its mobile money service M-PESA in Kenya. The Central Bank of Kenya (CBK) assembled a cross-functional team of experts from various departments, including Banking and National Payments, Bank Supervision, and Legal, to review the application for M-PESA. After being convinced about the safeguarding mechanism for customer funds, CBK authorized M-PESA.

CBK considered mobile money not as a banking service, but as a low-value retail money transfer service meeting CBK’s internal legal and risk criteria. CBK also distinguished between the conversion of cash into mobile money (and vice versa) and the acceptance of deposits from the public, emphasizing that mobile money providers were not accepting deposits from the public or contravening the Banking Act. This “legalized” mobile money, reaffirmed the government’s strong support for financial inclusion, and gave the industry a much-needed boost of confidence. Subsequently, several other mobile operators were allowed to offer mobile money services.

In 2014, the CBK issued the National Payment System (NPS) Regulations, which have codified many of the regulatory practices developed since the introduction of mobile money. CBK adopted an entrepreneurial regulatory approach, avoiding burdensome requirements

for non-bank players to participate in the market. It spurred innovation and growth while also maintaining the stability and robustness of the financial sector.

By contrast, despite having 15 mobile money (Mirani 2014) service providers, India lags far behind other developing countries in terms of market penetration of the service. This is mainly due to the unfavorable regulatory framework that requires mobile operators to work with banks to provide the services. However, banks do not reach into remote and rural areas, and mobile networks are not allowed to use their own network of sales agents for mobile money services. As a result, less than one percent (Leach 2015) of Vodafone's 173 million customers in India used the M-PESA service.



CASE STUDY
Offering Incentives for Re-energizing Low-income Groups

LOCATION India	POLICY TOOLS Subsidies, tax breaks	KEY ACTORS National and sub-national level governments, CSOs, NGOs, private entrepreneurs
POLICY INSTRUMENT TYPE Financial resources		

The energy shortage in India is most acute among its rural poor. The majority of the rural population relies on relatively inefficient, polluting and health-threatening fuels such as kerosene and firewood. More than 45 percent of poor households in rural areas lack reliable access to electricity, and almost 85 percent still use conventional fuels for cooking (Bairiganjan et al. 2010). This population spends a large amount of household income on energy from poorer quality energy services. Further, the electrification of rural India has been extremely uneven, leaving poorer states disproportionately in the dark. A large majority of households in states like Bihar, Uttar Pradesh, and Orissa remain without reliable access to electricity. Some SEs have developed innovative approaches to address these energy needs. Several different approaches have been undertaken such as solar home systems, mini-grids, and cooking and lighting products.

A supportive policy environment has played a catalytic role in the process and led to a fast growing clean-technology market. The Indian government formed the Ministry of New and Renewable Energy (MNRE, erstwhile Ministry of Non-Conventional Energy Sources) in 1992. MNRE has been at the forefront of many programs to increase the adoption of renewable energies in India. MNRE provides subsidies to Indian mini-grid players such as Husk Power, DESI Power and Saran Renewable Energy for deploying renewable energy utilities in villages, thus enabling affordability. Subsidies have also been helpful for Claro Energy, whose customers receive support to finance the upfront investment required for solar pumps for irrigation.

On the other hand, subsidies for traditional fuels, such as diesel and kerosene, distort the market and dissuade BoP consumers from switching to better energy sources. There is a need for a well targeted policy framework which not only incentivizes solar home systems or the mini-grids but also encourages low-income consumers to shift to new energy sources.

 		<p>CASE STUDY</p> <p>Providing a Nationwide Health Insurance Scheme for the BoP in India</p>
<p>LOCATION India</p> <p>IMPACT SECTOR Healthcare</p>	<p>POLICY INSTRUMENT TYPE Structure and capacity, financial resources</p> <p>POLICY TOOLS Development partnerships, subsidies, building</p>	<p>KEY ACTORS Ministry of Labour and Employment, state governments, insurance companies, public and private hospitals, third-party administrators, civil society organizations and donors</p>

Almost 59.2 percent of the Indian population earns less than USD 2 per day (World Bank n.d.). The existing health insurance schemes cover only a miniscule proportion of the Indian population, mainly from the economically well-off sections. Traditionally, private insurers have not considered the low-income population as a potential market. Private hospitals have been too expensive and the services at public hospitals are often insufficient or of poor quality.

Launched in 2008, Rashtriya Swasthya Bima Yojana (RSBY) is one of the largest health insurance schemes in the world. It aims at providing access to healthcare to 300 million people living below the poverty line in India. It covers health costs up to approximately USD 460 per year for diseases that require hospitalizations.

The rollout of RSBY has seen the involvement of several policy tools and actors working in tandem. Both public sector and private insurance players have joined forces to protect the poor from high hospital expenditures. The premiums, ranging from USD 10–18, are subsidized up to 75 percent by the national and state governments. Multilateral institutions such as the World Bank and GIZ offer technical advice. New technology allowing on-the-spot photos and documentation has been deployed for quick and easy enrollment. Insurers act to raise awareness of RSBY’s offers and enroll beneficiaries at the village level. Utilization rates increased when RSBY membership cards were issued immediately and clients were informed about how to file claims.

RSBY currently has a membership base of almost 37 million families (RSBY n.d.), or almost 188 million individuals. It has paid for 6.3 million hospitalization cases since it started in 2008, with an annual average of 26 hospitalizations per 1,000 members. RSBY has also incentivized hospitals to extend their service portfolio and add capacities to treat poor beneficiaries.

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