ESMAP
Energy Sector Management Assistance Program

Improving Energy Access to the Urban Poor in Developing Countries

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The Energy Sector Management Assistance Program | The World Bank

ESMAP Mission

The Energy Sector Management Assistance Program (ESMAP) is a global knowledge and technical assistance trust fund program administered by the World Bank and assists low- and middle-income countries to increase know-how and institutional capacity to achieve environmentally sustainable energy solutions for poverty reduction and economic growth.

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CONTENTS

ABBREVIATIONS AND ACRONYMS

AEC	Ahmedabad Electrical Corporation
AED	Academy for Educational Development
AMC	Ahmedabad Municipal Corporation
ANEEL	Agência Nacional de Energia Eléctrica
ARCSP	Asia Regional Cook Stove Program
ARI	Acute respiratory infections
ARTI	Appropriate Rural Technology Institute
AVSI	Association of Volunteers in International Service
BEST	Bombay Electricity Supply and Transport
BCSIR	Bangladesh Council of Scientific and Industrial Research
BPL	Below poverty line
CBO	Community-based organization
CDM	Cooperação para o Desenvolvimento e Moradora Humana
CELPE	Companhia Energética de Pernambuco
CFC	Chlorofluorocarbon
CFL	Compact fluorescent light
CMC	Community management committee
COELBA	Companhia de Electricidade do Estado da Bahia
CSR	Corporate social responsibility
CSP	Child Survival Program
CTC	Community toilet complexes
CV	Curriculum vitae
DC	Direct current
DFID	Department for International Development (UK)
ESE	Estratificacion socioeconomica (socio economic stratification)
ESMAP	Energy Sector Management Assistance Program
FPS	Fair Price Shops
GERC	Gujarat Electricity Regulatory Commission
GIS	Geographic information systems
GNESD	Global Network on Energy for Sustainable Development
GPOBA	Global Program for Output-Based Aid
IAP	Indoor air pollution
ICS	Improved cook stove
IEC	Information, education and communication
IFC	International Finance Corporation
INDCARE	Integrated National Development Centre for Advancement Reforms and Education
IVA	Independent verification agent
KAP	Knowledge, attitude and practices
KPT	Kitchen performance test
Kgoe	Kilograms of oil equivalent
kW	Kilowatt
LPG	Liquid petroleum gas
M & E	Monitoring and evaluation
MCD	Municipal Corporation of Delhi
MDG	Millennium Development Goal
MHT	Mahila Housing SEWA Trust (Gujarat)
MNRE	Ministry of New and Renewable Energy
MPA	Methodology of participatory assessment
MRD	Mobile retail dealer
MUDRA	Mainstreaming of Urban Poor Women in Design for Resource Assessment
NDPL	North Delhi Power Limited
NGO	Nongovernmental organization
NOC	No Objection Certificate

NSDF	National Slum Dwellers Federation
PIL	Public interest litigation
PLA	Participatory learning and action
PPP	Public-private partnership
R & D	Research and development
SHG	Self help groups
SME	Small and medium entrepreneurs
SNP	Slum Networking Project
SPARC	Society for the Promotion of Area Resource Centres
TERI	The Energy and Resources Institute
ULB	Urban local body
UN	United Nations
UNDP	United Nations Development Program
UNICEF	United Nations International Children's Education Fund
USAID	United States Agency for International Development
VERC	Village Education Resource Centre
WB	World Bank
WBT	Water boiling test
WC	Water closet
WHC	Ward Health Committee
WHO	World Health Organization

FOREWORD

Rapid urban growth in developing countries has created an unprecedented demand for energy services. Cities face the enormous challenge of improving energy access to urban poor in order to better their overall socioeconomic conditions. According to the World Bank, 90 percent of urban growth is concentrated in the developing world, and approximately 70 million people will move to urban areas every year.[1] Furthermore, the next 20 years will witness doubling urban poor populations in South Asia and Sub-Saharan Africa.[2] This will put tremendous pressure on cities in these regions to provide basic services, including energy services, to slum areas.

Although rural energy access is a recognized priority, the issue of energy access for urban poor populations has not been given the requisite focus or priority in research and policy. Nevertheless, there are examples of successful approaches in providing energy access to the poorest segments of society.

The goal of this knowledge product is to document global best practices that can be shared amongst developing countries stakeholders to address issues of energy poverty and access. The case studies in this report represent innovative and diverse efforts, enabled by specific factors that may be replicated under identifiable circumstances.

The best practices in this report come from India, Bangladesh, Brazil, and Colombia, and were selected for their focus on improving energy access to the urban poor, particularly slum and pavement dwellers. These case studies demonstrate the importance of global knowledge sharing, most immediately between practitioners and policymakers.

There is an urgent need to address the issues related to the lack of access to energy services and inefficiencies in the supply of energy services to urban poor. Improved energy access is a crucial means of improving the quality of life and socioeconomic status of the urban poor. This, in turn, will help to improve their contribution to economic growth and environmental sustainability, at local and national levels.

[1] http://go.worldbank.org/KT759KE9S0, last accessed on December 1, 2010.
[2] Ibid.

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EXECUTIVE SUMMARY

The case studies documented in this report aim to inform the energy access community (including practitioners, civil society groups, project planners, end users) about best practices of successful energy access initiatives targeted at slum dwellers. Eight case studies focusing on electrification and household energy were selected from India, Bangladesh, Colombia and Brazil, all countries that have had varying success in providing access to modern energy services for slum dwellers. The cases had to meet all or some of the following criteria:

1 | Limited to developing countries;
2 | Demonstrate innovative methods of improving energy access, including collaborative stakeholder engagement;
3 | At least one example of small local energy service providers;
4 | Contributed to community development by promoting local skill development and income generation; and
5 | Representative of electricity and different sources of household energy.

The case studies describe the existing conditions in the slum, type of energy service provided, the key characters involved, conditions for success, and replicable factors. Common barriers to energy access were identified and impact on the lives of slum dwellers, were also discussed. The table gives a brief overview of the case studies covered.

	CASE STUDY	BRIEF DESCRIPTION	COUNTRY
Chapter 1.	Electricity for Pavement Dwellers	Legal electricity supply provided to pavement dwellers	India
Chapter 2.	Ahmedabad Slum Electrification Project	Legal electricity supply provided to slums	India
Chapter 3.	Sulabh Community Toilets and Biogas Plants	Construction of community toilets in the slums Attached biogas plants generate energy from solid waste	India
Chapter 4.	Commercializing Improved Cookstoves	Dissemination of improved cookstoves targeted at 400 urban slum households	Bangladesh
Chapter 5.	LPG – Mobile Retail Dealers	Mobile LPG retailers connect new customers and refill gas cylinders in homes	Bangladesh
Chapter 6.	Coelba Community Agent project	Community outreach using members of local community as agents for mediation	Brazil
Chapter 7.	Provision of natural gas services to urban poor	Connecting urban poor households to natural gas	Colombia
Chapter 8.	Slum upgrading	Community based initiative overcomes barriers to accessing electricity	India

Achieving Energy Access: Summary of Findings

The documented cases highlight several common barriers facing the urban poor in achieving legal, safer, and cleaner energy access.

1 | Common barriers to energy access

Several common barriers to legal and cleaner energy access by urban poor communities in developing countries were identified:

- **High cost of service |** The urban poor often face multiple constraints—including limited disposable income—due to the informal nature of their livelihood. They are often unable to afford the infrastructure costs such as meters, wires, appropriate stoves, and safe construction materials. They face the additional challenge of untimely bill payment, resulting in disconnection of service. This issue emerged as an obstacle in the cases from Colombia, India, and Brazil.
- **Illegal status of slum dwellers |** Due to their illegal status, slum dwellers were often unable to provide the required documentation for electricity connection, such as proof of permanent location. The illegal status barrier was an acute issue in the Indian cities of Mumbai, Ahmedabad, and New Delhi.
- **Lack of education and awareness |** Slum dwellers are often unaware of the health and financial benefits of legal and cleaner energy access, which was noted in almost all the documented cases.
- **Lack of trust between communities and service providers |** This prevented the establishment of a relationship between urban poor communities and energy service providers. This was apparent in New Delhi, India, as well as in Salvador, Brazil.
- **Lack of infrastructure |** The appropriate energy infrastructure forms a basic necessity for access. In Bangladesh, the lack of access to LPG retail outlets was a constraint to obtaining LPG.

2 | Overcoming the barriers to energy access

Different approaches to obtaining energy access were employed in each of the cases to varying degrees of success:

- **High cost of service |** It was essential to establish funding mechanisms to make energy connections affordable. In Ahmedabad, US Agency for International Development (USAID) funds were granted to address the affordability gap. In Colombia, Word Bank funds were disbursed through an output-based mechanism. In New Delhi, a nongovernmental organization (NGO**)** offered a one-time loan to the community and in Salvador, the service provider helped subsidize the costs in conjunction with a government-run social tariff program to ensure affordability of regular bills.
- **Negotiating illegal status |** The initiatives in Mumbai, Ahmedabad, and New Delhi demonstrated that the constraints related to illegal tenure could be overcome through individual arrangements and negotiations with the responsible agencies.

- **PROMOTING EDUCATION AND AWARENESS |** The cases of New Delhi and Bangladesh demonstrated that targeted awareness raising and education campaigns, emphasizing the benefits of cleaner, more efficient and legal energy access, ultimately facilitated the demand for such services by the urban poor community.
- **BUILDING TRUST BETWEEN COMMUNITIES AND SERVICE PROVIDERS |** Several of the cases demonstrated the importance of building and facilitating healthy customer and service provider relationships. The Ahmedabad, New Delhi, and Salvador cases highlight the energy service providers' need for assurance that the urban poor can be responsible customers. Similarly, urban poor populations have to be convinced that the appropriate agencies and authorities recognize and will address their concerns. This relationship can be fostered through training and involving community members to liaise between the customers and service provider, as seen in Salvador, Brazil.
- **PROVIDING INFRASTRUCTURE |** In Bangladesh, service provider TOTALGAZ established a system for convenient access to LPG cylinders. Mobile retail dealers (MRD) were trained and employed to bridge the gap in availability and demand. As a result, energy access was secured while also creating livelihood opportunities for the urban poor.

3 | Other factors enabling energy access

Many other factors were essential to achieving energy access for the urban poor communities. These are grouped and classified as follows:

- **EMPOWERING COMMUNITIES |** The cases from New Delhi, Ahmedabad, Mumbai, Salvador, and Bangladesh demonstrated the importance of supporting and investing in communities. Whether through community organizations, leadership, participation, or creating capacity at the local level, community empowerment was found to be a crucial factor for enabling energy access.
- **COLLABORATIVE ENGAGEMENT OF MULTIPLE STAKEHOLDERS |** Engaging and working with multiple stakeholders proved a vital component across most of the initiatives documented.
- **USING SIMPLE, INNOVATIVE TECHNOLOGIES |** The Sulabh, India, case and the improved cook stoves case in Bangladesh demonstrated the importance of simple and innovative technologies in facilitating cleaner energy access.
- **ACCESS TO CREDIBLE INFORMATION |** The cases from Colombia, Brazil, and India demonstrated the importance of having access to accurate data on the energy access situation in presenting a case for service providers to facilitate legal and cleaner energy access for the urban poor. Credible information enabled properly targeted subsidies, effective interventions, and successful energy access projects.

4 | Sustainability and replicability of energy access initiatives

- **WILLINGNESS OF STAKEHOLDERS TO CONTINUE THE PROJECTS |** The involvement of all stakeholders was crucial to program success, but sustainability and replicability of these initiatives was contingent upon the willingness of service providers, NGOs, and communities to take these initiatives further.

- **ENABLING POLICY ENVIRONMENTS |** a successful social tariff program in Brazil and amendments to the Slum Act in Mumbai ensured continuity of energy services provision to the urban poor community.
- **ESTABLISHMENT OF FINANCIAL AND INSTITUTIONAL MECHANISMS TO ENSURE CONTINUED ACCESS TO ENERGY SERVICES |** For example, in Ahmedabad, community bill payment centres were set up to ensure convenient access by the urban poor and monthly billing (vs. bimonthly billing) was introduced to address issues of affordability.

CONCLUSIONS

Unique geographic, poverty, and policy contexts make it difficult to generalize about factors that enable or constrain energy access. However, this study demonstrates several common barriers and highlights varied ways to overcome them. It shows that success is contingent upon several factors working together, such as stakeholder collaboration and community empowerment. Finally, the sustainability and replicability of these initiatives depends on the willingness of stakeholders to assume continued responsibility and the establishment of strong financial and institutional mechanisms.

REPORT STRUCTURE

The report presents the case studies and their analysis as follows: Chapter 1 describes the project background and methodology adopted for this study. Chapter 2 outlines the issues surrounding energy access including common barriers, success factors, sustainability and replicability potential of the documented initiatives. The annexes contain detailed documentation of each energy access initiative.

1 | INTRODUCTION

BACKGROUND

Poverty is an increasingly visible urban issue. According to the World Bank, **poverty affects approximately one third of all urban residents. Approximately 70 percent of the urban poor live in** Sub-Saharan Africa and South Asia.[3] Furthermore, an estimated **one third of the urban population in developing countries—almost a billion people—currently live in slums.**[4] According to UN HABITAT, 43% of the urban population in developing countries resided in slums in 2003, which stands in stark comparison to only 6% in developed countries.[5] In India, for instance, population growth and urbanization have resulted in deepening urban poverty, increased growth of urban slums and a decline in the delivery of basic services (GNESD 2008). This phenomenon of growing urban poor and slum residents in developing regions of the world poses significant challenges to sustainable and inclusive development.

The issue of growing urban poverty in developing countries is a result of increasing population growth rates, migration, and rapid urbanization. Developing countries are experiencing a widening gap between the wealthy and the poor, and their urban poor face barriers that prevent them from accessing basic infrastructure and services—including energy (Baker 2008). Although access is generally higher in urban areas than rural, it remains low for the urban poor, particularly in terms of quality and affordability (Baker 2008; GNESD 2008). Services to these populations are often unreliable, sporadic, and/or accessed informally. Limited affordability for public services combined with the unwillingness of private utility companies to provide services to low-income populations compounds the issue (Baker 2008; GNESD 2008). In addition to unique challenges faced in different regions, lack of formal monitoring mechanisms, disaggregated data for urban populations, and illegal tenure continue to prevent energy access for urban and peri-urban poor (GNESD 2008).

In 2000, the United Nations Development Program (UNDP) defined energy poverty as "the absence of sufficient choice in accessing adequate, affordable, reliable, quality, safe an environmentally benign energy services to support human development" (UNDP 2000). At a household level, this refers to the lack of modern cooking fuels and minimum electricity for lighting purposes (World Bank and UNDP 2005). A lack of legal access to cleaner, efficient, and sustainable energy is a pressing concern for populations in the developing regions of Africa, Asia, Latin America, and the Caribbean, where large concentrations of urban poor reside and rely on traditional fuels (Dhingra, Gandhi, Chaurey *et al* 2008; GNESD 2008; World Bank and UNDP 2005). This has emerged primarily from the Johannesberg Plan of implementation from the World Summit on Sustainable Development (GNESD 2008).

Although many of the urban poor have energy access, it is often illegal, unsafe, and hazardous to human health, as well as to the environment. The challenge is to facilitate the transition to cleaner and more sustainable fuels for improved quality of life (GNESD 2008; World Bank and UNDP 2005). While increased access to energy services cannot directly result in enhanced socioeconomic development, a lack of energy is a severe developmental constraint that hinders achievement of the Millennium

[3] go.worldbank.org/D7G2Q70170, last accessed on December 20, 2010.
[4] Ibid.
[5] ww2.unhabitat.org/mdg, last accessed on September15, 2010.

Development Goals (MDGs). Therefore, significant focus is now being given to reduce energy poverty in order to ensure equitable development of all segments of society (GNESD 2008)

International research and experience demonstrates that energy access is crucial for poor populations to break out of the cycle of poverty (World Bank and UNDP 2005). All 10 Task Forces of the UN Millennium Project have highlighted the need to improve access to energy services as an essential basis for achieving each MDG, particularly among urban poor populations (GNESD 2008; World Bank and UNDP 2005). Although none of the MDGs overtly target energy access, improving services to modern cooking fuels, improved cook stoves, and access to electricity are recognized as necessary to achieve the MDGs (GNESD 2008; World Bank and UNDP 2005). Yet, urban poor populations continue to face barriers to legal access of cleaner, more sustainable energy.

Available literature demonstrates the importance of promoting energy access for sustainable and inclusive development. This, however, has not translated into policies targeted at growing urban poor populations. Despite this, examples of successful initiatives can provide crucial lessons, helping to identify barriers and provide solutions to achieve and sustain energy access for urban poor populations.

Documenting successful energy access initiatives highlights the challenges of poverty, lack of infrastructure, and local contexts. It explores solutions to this ever-growing problem, and informs policy formulation on sustainable energy access (GNESD 2008). This study promotes knowledge sharing amongst south countries.

Objectives of the Study

To promote innovative best practices in energy access initiatives, with enabling factors that can be replicated by south countries experiencing similar problems. The study identifies stakeholders and practitioners who played a key role in each of the best practices.

METHODOLOGY

To achieve the stated objectives, a framework was developed to select, review, and document best practices from developing countries. Cases were selected in South Asia and Latin America, and partner organizations in the selected countries. These cases were documented and analysed for specific barriers to energy access, how they were overcome, and the factors that enabled sustainability and replicability of the specific energy access initiatives.

Framework for the Selection of Best Practices

To conduct this study, a framework was developed to effectively structure the report. The first step was to identify case studies in developing countries where energy access to urban poor had been provided or improved. Preliminary investigations revealed different approaches towards improving energy access. For example, in some cases the utility companies played a lead role while in others instances the community worked hard to achieve energy access.

The second step was to develop a set of criteria to select diverse best practices (Box 1). The cases selected had to demonstrate innovative approaches towards improving energy access and offer evidence of effective stakeholder collaboration. The cases identified were evaluated as per these criteria, after which a few cases were chosen to be included in the knowledge product (Table 1). It was important for the final output (i.e., knowledge product) to highlight diverse but effective approaches used to achieve one common objective—provide/improve energy access in slums.

While selecting best practices, efforts were made to ensure that the cases were not similar to each other and that they adopted different approaches to address the issue of energy access in slums. It was decided that even if the selected cases were not able to meet all the identified criteria, they needed to present a strong case of an approach towards improving energy access to qualify for documentation as best practice.

Box 1.1 | Criteria for Selection of Best Practices

1| Best practices should be from developing countries in South Africa, South East Asia, and Latin America from a maximum of 4-5 countries.

2| Best practices should be representative of a specific approach towards addressing the issue of energy access in slums, including:

- Government policies and programs
- City level strategies, plans, or projects
- Public-private partnerships (PPPs)
- Donor-funded projects
- Initiatives of community
- Initiatives of community based organizations (CBOs)
- Initiatives where nongovernment organizations (NGOs) played a key role
- Initiatives of utilities
- Initiatives where CBOs, NGOs, utilities, and local governments partnered with each other
- Communication and awareness campaigns, or
- Technological or market innovations or any other innovative approaches to improve energy access to slum dwellers

3| A few selected best practices should showcase the involvement of small local energy service providers in provision of energy services or equipment.

4| Preference should be given to initiatives that have been successful; have replicability potential; have contributed to skill development and livelihood generation for local community.

5| Selected best practices should represent different fuels and energy sources, like electricity, LPG, piped gas, biogas, etc. They should also refer to different uses of energy sources, like cooking, lighting, heating, etc.

Table 1.1 | Selected Best Practices

Title	City/State	Country / Region	Brief Description	Type of case study	Energy source	Service provider
Slum Electrification Project	Ahmedabad	India, South Asia	Safe and legal electricity supply provided to slums	• City government, utility, NGOs and community partnership • Donor agency also involved by subsidizing cost of electricity connections	Electricity	Utility
Electricity for Pavement Dwellers	Mumbai	India, South Asia	Legal electricity supply provided to pavement dwellers	• Initiative of community and CBO • NGOs played a key role • Community demanded its right to legal and regular electricity connections	Electricity	Utility
Sulabh Community Toilets and Biogas Plants	Delhi	India, South Asia	Community-based toilets constructed in slums with the waste used to generate energy for use by slum dwellers.	• NGO initiative • Innovative approach • Skill development and employment generation for local community	Biogas used for cooking, lighting, and electricity generation	NGO by involving local community
Safe and Legal Connections for Slum Communities	Delhi	India, South Asia	Safe and legal electrification through community education and access to microfinance	• CBO initiative executed with funding partner and service provider	Electricity	Utility
Natural Gas distribution to Low Income families in Colombia	Caribbean coastal region	Colombia, Latin America	GPOBA and Fundación Promigas* partnered to provide natural gas connections to Colombia's poor population.	• Donor-funded project executed by partnering with local agencies	Natural gas	Local distribution company
Commercialization of Improved Cook Stoves for reduced indoor air pollution	Saidpur and Parbatipur	Bangladesh, South Asia	Dissemination of improved cook stoves to promote clean use of biomass. Local community is being involved to create local entrepreneurs.	• Donor-supported project • Local entrepreneurship	Clean use of biomass	Local entrepreneurs
LPG Mobile Retail Dealers (MRDs)	Dhaka	Bangladesh, South Asia	Commercial initiative aims to deliver LPG connections and refill cylinders to consumers who use biomass to meet their energy needs. This project develops MRDs from urban poor communities as entrepreneurs.	• Initiative of gas distribution company • Targets urban SMEs; will subsequently target slums • Empowers urban poor to become entrepreneurs for provision of energy services	LPG	MRDs (entrepreneurs created from urban poor communities)

Title	City/State	Country / Region	Brief Description	Type of case study	Energy source	Service provider
Coelba Community agents	Bahia, Salvador	Brazil, Latin America	Reduce commercial losses through the mediation of agents embedded in communities.	• NGO initiative by involving local community	Electricity	Private utility company

*A charitable foundation established by Colombian gas distribution holding company, Promigas.

Review of Best Practices

For each case, a literature review was conducted to collect relevant information available from secondary sources to provide an in-depth understanding of how the project was conceptualized, formulated, and implemented while highlighting problems and solutions. It also served to identify the stakeholders and the role they performed.

The next step entailed a primary survey of the case study area and stakeholder discussions. These field visits sought to understand the experiences of the different stakeholders; assess the current status of the initiative; gauge the operational mechanism and its effectiveness, impact, and continuity; and identify key features attributed to the project's success. These visits were also an opportunity to verify the secondary information collected through literature review, to collect missing information, and clarify the information gathered in the literature. After gathering the information, a framework was developed to review the key features of the case studies.

The case study documentation is organized as follows:

1 | **BACKGROUND |** The background to the case offers a detailed description of where and why the study was conducted. It includes the context of the case study, problems faced by the community, and key events that catalyzed the project's initiation.

2 | **PROJECT DESCRIPTION |** The project description includes the main objectives, a description of the target group/beneficiaries, and a chronological report of what happened during the case study.

3 | **KEY ACTORS AND THEIR ROLES |** All the actors involved in the case study are described--utilities, NGOs, community-based organizations (CBOs), communities, national/state governments, municipal corporations, and individuals.

4 | **PROJECT IMPLEMENTATION |** This section contains the methodology of the initiative implementation and looks specifically for: regulatory and institutional arrangements; financial arrangements; capacity building, skill building, and training of the local community; technology development; and innovative approaches.

5 | **RESULTS AND IMPACTS |** Specific achievements and impacts in terms of benefits to all key actors are highlighted. Particular attention is paid to the achievements of the initiative and the impacts to stakeholder benefits.

6 | **ENABLING ENVIRONMENT AND BARRIERS |** Factors that led to the initiation, implementation, and success of the case study are documented in this section. The enabling environment are classified into policy, institutional (government, nongovernment, donor, etc.), financial, technology, or community interventions. Barriers or challenges to achieving energy access are also documented, as well as their solutions.

7 | **KEY LESSONS, CONTINUITY, AND REPLICABILITY |** Key lessons from the case study experience are described along with a discussion on the replicability potential of the initiative. This section also focuses on how the initiative will carry on, highlighting the institutional, financial, and managerial arrangements made to ensure project continuity.

Once the cases were documented, they were analyzed for specific obstacles towards achieving energy access. These were classified into major groups, and then reviewed to understand how the barriers to

energy access were overcome. The analysis also includes a review of the factors that enabled sustainability and replicability of the energy access initiatives in each case.

2 | ACHIEVING ENERGY ACCESS FOR THE URBAN POOR

COMMON BARRIERS TO ENERGY ACCESS

The cases documented in this study highlight some of the common obstacles facing the urban poor in achieving access to modern energy services. They also demonstrate that overcoming these barriers constitutes a first step towards achieving energy access. The following section summarizes the most common barriers to legal and modern energy access by urban poor communities. These barriers include: affordability of services, illegal tenure, lack of education and awareness among the urban poor communities, lack of trust between communities and service providers, lack of infrastructure to enable access and lack of adequate or appropriate information on energy access or the urban poverty status.

1 | Affordability of Services[6]

For the urban poor, affordability remains a pressing issue with regards to legal energy access. Given limited and often irregular incomes, they are unable to afford either the required upfront costs for legal energy access, such as installing meters/wiring in their houses, financing the appropriate stoves, retrofitting their dwellings with safe building materials, or paying bills in a continuous or consistent manner required by service providers – or both.

- In Colombia, a pilot study of the urban poor community determined that the affordability of upfront costs was the main issue to access cleaner energy - despite the fact that natural gas was an abundantly available resource in the country. Communities were not able to afford the $137 amount required to install new gas stoves and achieve pipeline connectivity.[7]
- Similarly, in New Delhi the slum community could not afford the required upfront costs for their electricity connections (meters, wiring etc.).
- This was also the case in Ahmedabad, where the affordability of new electrical connections was an issue for the slum-dwellers both in terms of the upfront costs and, in the ability to pay their bills.[8]
- In Salvador, communities in the *favella* continued to use illegal connections because they perceived that they would be unable to afford their energy consumption bills[9]. This posed a barrier to legal energy access efforts.[10]

[7] It also demonstrated that poor populations need to prioritize their income uses; energy costs are usually not prioritized if the urban poor can access resources for cheap or for free.

[8] Even after the provision of legal electrical connections, continuous affordability of electricity bills posed an obstacle. For instance, the first bill showed that slum dwellers had to pay Rs. 200–250 per month ($4.50 - 5.50). However, their affordability levels for illegal services were of the range of Rs. 150 (approximately $ 3) flat, irrespective of the total consumption.

[9] This unaffordability led to continued illegal usage of electricity by *favella* residents. Another problem in this case was the high electricity consumption which was due to the use of inefficient appliances by the *favella* residents and which led to high bills that they were unable to pay.

2 | Illegal Tenure

Legal recognition of settlements forms a basis for the pre conditions that are required for households to access legal energy services like electricity or LPG. However, given the informal nature of their habitats, slum and pavement dwellers are often unable to produce the documents considered necessary to meet some of the basic requirements for getting legal energy access – such as proof of residence, or a permanent address.

- In Mumbai, the utility company did not recognize the pavement dwellers[11] as potential customers because of their lack of legal status.
- Similarly, in Ahmedabad, the utility company was hesitant about providing services to households that did not have proof of residence.
- This was also the case in New Delhi, where slum-dwellers faced similar hurdles to Mumbai and Ahmedabad in terms of showing service providers the requisite documentation that would enable legal electricity access. The service provider, North Delhi Power Limited (NDPL) was concerned about the perception of supporting temporary or 'illegal' habitats.

3 | Lack of Education and Awareness

Lack of education and limited awareness surrounding the health and/or financial benefits of cleaner and efficient fuels contributes to slum dwellers' resistance to switching from biomass consumption to cleaner, less polluting energy resources. It can also impede their decision to select or invest in energy efficient appliances.

- In New Delhi, illegal electrification continued despite high risks to safety within the community, because the risks of illegal electrification were not clear to the urban poor community.
- The improved cook stoves (ICSs) in Bangladesh, although introduced in the 1970s, had not achieved buy-in from the communities despite the free distribution of stoves. This appears to have been the result of community resistance to behaviour change stemming from habits of traditional energy-use, and a lack of understanding of the harmful impacts of such practices.
- Similarly in Colombia, the community was uneducated about the negative health impacts of using cheaper, polluting fuels or the benefits of using clean energy; which led to their continued usage of traditional cooking fuels.
- In Mumbai and Salvador, communities were unaware of the financial benefits of legal energy access. The illegal energy services that they patronize invariably costs more, as it is unreliable and of poor quality.

4 | Lack of Trust

A lack of trust between service providers and the urban poor can pose a significant barrier to facilitating clean energy access. In cases where established, reliable relationships did not exist, both sides shared misconceptions and pre-conceived notions that prevented new customer–service relationships.

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[11] Though refered to as pavement dwellers in India, these are urban poor squatters who occupy informal shacks and live in settlements along pavements in the city.

- In New Delhi, the NDPL did not perceive the slum-dwellers to be permanent, reliable customers and was hesitant to provide electricity access to them.
- Similarly in Salvador, communities living in the *favella* were resistant to allowing a major service provider to enter and promote its services because of the existence of a conflicting relationship with the service provider and the perception that non-payment of bills would result in service cuts and legal remediation by the service provider.

5 | Lack of Infrastructure

Lack of basic infrastructure prevented the efficient distribution of energy services to the urban poor.

- In Bangladesh, consumers lacked convenient access to liquid petroleum gas (LPG) cylinders, due to a lack of LPG retail outlets in their vicinity, which prevented their use of LPG.

OVERCOMING THE BARRIERS TO ENERGY ACCESS

The barriers discussed in the previous section were addressed for slum dwellers to gain legal access to modern, clean energy sources. The case studies illustrate the diverse ways in which these barriers were addressed. The following section summarizes these experiences.

1 | Facilitating High Connection Costs[12]

Access to funding was crucial in helping households afford the high upfront costs associated with access to energy services.

- In Colombia, using a $5.1 million grant from the World Bank, the Global Program for Output Based Aid (GPOBA) provided money to Promigas' subsidiary gas companies to subsidize the upfront connection costs for natural gas connectivity in poor areas. This money was also disbursed to the gas companies to provide a loan that subsidized bill payments for the urban poor households over a period of 6 years. Households that relied on LPG also received a $20 voucher as a financial incentive towards the connection cost.
- In Ahmedabad, a grant from United States Agency for International Development (USAID) enabled the electrification of 700 slum households. USAID extended a second grant to electrify an additional 2000 households and these funds were used to subsidize electricity connections for three years through an instalment mode of payment. Payments were also facilitated with loans through community based banking.
- In New Delhi, Integrated National Development Centre for Advancement Reforms and Education (INDCARE) Trust provided the funds to offer the community a time bound, micro-loan that subsidized the upfront costs of the electrical connections.[13]
- In Salvador, the service provider Companhia de Electricidade do Estado do Bahia (COELBA) subsidized the installation of new connections and theft resistant meters and facilitated community registration into a social tariff program run by the government to further facilitate

[13]The community was also taught how to negotiate on their own behalf, such that after the first overestimated bill was received the community was able to have it revised.

affordability. COELBA also worked to negotiate affordable payment plans with their low-income clients, particularly those who had payment defaults or outstanding debts.

Supporting energy efficiency in the target urban poor communities also facilitated energy affordability in some cases. In Salvador, the appliance exchange was an initiative that helped overcome affordability issues faced in the community by helping them exchange energy inefficient appliances for newer ones that would result in less energy consumption. Similarly, in Ahmedabad, the community was provided a compact fluorescent light (CFL) bulb as part of the program that led to reduced energy use.

2 | Negotiating Tenure Requirements

In several cases, tenure requirements were negotiated between the utilities, the local authorities and communities in order to facilitate energy access (specifically electricity) for urban poor populations.

- In Mumbai, local NGOs supported the communities to hold a series of negotiations between Mahila Milan and Bombay Electricity Supply and Transport (BEST). A government letter was issued after the negotiations, declaring that the dwellings would not be demolished for one-and-a-half years. This served to reassure the service provider, that its supply of electricity to the pavement dwellers would neither place the company in breach of its own rules, nor would it be seen to symbolize *de facto* security of land tenure for the pavement dwellers. Through negotiations that occurred at several stages, the issue of tenure and other requirements demanded by the service provider were met.
- Similarly in New Delhi, the slum community was able to negotiate tenure requirements and overcome the legality barrier through a series of discussions with the service provider, NDPL.
- In Ahmedabad, the Ahmedabad Municipal Corporation (AMC) provided 10 year non-eviction certificates to each household, which helped them meet the pre-requisites to access electrical services. The NGO SAATH filed a public interest litigation on behalf of the community to the High Court to challenge a law that prohibited provision of services to areas that do not have building permission. The High Court ruled that slums do not need building permission to obtain access to services.[14]

3 | Promoting Education and Awareness

By utilizing awareness-raising campaigns and education, urban poor communities were informed of the benefits of cleaner, efficient and legal energy access, which facilitated demand for such energy services by the community.

- In New Delhi, INDCARE Trust worked with the slum community to raise awareness of the safety risks of illegal electrification and the benefits of legal connections.
- Similarly, in Colombia an awareness-raising and media campaign was used to promote natural gas connections and their usage by the community.

[14] The utility company AEC pushed to require an indemnity bond that would ensure that at any later stage the slum dweller could not claim tenureship on the basis of the bills and or the electrical connection they provided.

- In the ICS case in Bangladesh, the NGO Concern was responsible for raising awareness of indoor air pollution's (IAP's) adverse effect on health and for promoting behavioural changes in relation to health and kitchen hygiene. Billboards, booklets and posters were used to market improved cook stoves, along with detailed explanations of their functioning and benefits.

4 | Building Trust

Energy service providers need assurance that the urban poor will be responsible customers, while the urban poor communities need to trust that authorities will address their concerns; a lack of trust between the two can lead to failure in successful provision of services.

- The *Parivartan* program in Ahmedabad proved that an existing relationship between service providers and the community, was instrumental in the provision of energy services to the community. In places where trust or established relationships were lacking, the service providers and communities had to work to develop new relationships.
- In New Delhi, NDPL and USAID approached INDCARE Trust to serve as an entry point into the community, who were unwilling to allow them access. INDCARE Trust was known to the community and supported negotiations on their behalf with the service provider.
- Similarly, in Salvador, the NGOs Association of Volunteers in International Service (AVSI) and Cooperação para o Desenvolvimento e Moradora Humana (CDM) worked with members of the community to train them as liaisons between the urban poor customers and the service provider. Building trust within the community through embedded agents helped to establish a balanced relationship based on mutual trust between the customers and the company. These community agents served to broker the new customer and service provider relationships.

5 | Providing Infrastructure

The lack of basic energy infrastructure and distribution systems makes the provision of energy services to the urban poor difficult.

- In Bangladesh, TOTALGAZ worked to ensure convenient availability of LPG cylinders to their customers by employing mobile retail dealers (MRDs) from the urban poor community. The MRDs bridged the gap in availability of LPG cylinders in the community, which has convenient access to these cylinders.

Other Factors Enabling Energy Access

Besides addressing the initial barriers to accessing clean and modern energy sources legally, the cases documented in this study indicate that there are several other enabling factors that can lead to the successful provision of energy services to the urban poor. These are: community empowerment, engaging multiple stakeholders, using innovative and simple technologies, and accessing adequate and appropriate information.

1 | Empowering Communities

Community empowerment through the establishment of strong community organizations, dynamic leadership, and active community participation at a local level ultimately helped facilitated energy access to the urban poor in several cases.

- In New Delhi, INDCARE Trust helped to build the capacity of the community by providing instruction in negotiation skills. This helped them to articulate their demands and negotiate on their own behalf for better services. Women from the community were also supported to organize themselves into self-help groups to negotiate their energy requirements.
- In Ahmedabad, NGOs worked to build up capacity within the slum community to negotiate and secure their own demands. In this case, specific training programmes were also conducted for women to train them on energy-efficiency measures as a means to keep the household electricity bills under control.
- In Mumbai, community-based demands for electricity were led by the Mahila Milan, a women's group within the community, who played a critical role in negotiating during the process of getting legal electricity connections from the utility.
- Similarly in Salvador, the COELBA community agents were members from the *favella* community trained to liaise between the service provider and the customers.
- In the cases from Bangladesh, the training of entrepreneurs to promote the cook stoves and mobile retail dealers to facilitate the delivery of LPG cylinders were examples of community empowerment through capacity building.

2 | Collaborative Engagement of Multiple Stakeholders

The collaboration of multiple stakeholders and actors was a success factor involving all cases. Established and reputable NGOs with expertise in specific areas and access to the community, or agencies with requisite funding all collaborated with communities and service providers for successful energy access initiatives.

- In Ahmedabad, SAATH and Gujarat Mahila Housing SEWA Trust (MHT) played an important intermediary role to facilitate energy access. Their collaboration with the community, funding agencies and the service providers resulted in the provision of energy services at a low cost to urban poor consumers (USAID 2006).
- In New Delhi, collaboration between public, private and community organizations facilitated legal electrification of the Bhalla Factory and the Jaipur Golden slums. INDCARE Trust is a Delhi-based grassroots NGO that targets women and uses microfinance tools to promote development. It played an essential role towards enabling project goals and achieving energy access for slum dwellers. Of particular note was their ability to effectively liaise with the community and mediate between the utility company, the NDPL and funding agency, USAID, in order to target community needs and ultimately overcome barriers to energy access.
- In Mumbai, the collaborative engagement between the community and NGO was instrumental in successfully accessing, managing and monitoring energy services from the urban poor community.
- In Colombia, energy access hinged on a unique model of financial and implementation arrangements that engaged multiple stakeholders to leverage their core competencies and

areas of expertise. The Global Program for Output-Based Aid (GPOBA), which distributes funds once outputs are shown, collaborated with Promigas - Colombia's largest natural gas holding and distribution company.

- In Salvador, this was also demonstrated, though to a lesser extent, where community, NGO and service provider collaboration ultimately enabled energy access in the slums.
- In Bangladesh, both the improved cook stove and mobile retail dealer's cases successfully involved multiple stakeholders.

3 | Using Simple, Innovative Technologies

Innovative technologies that are easy to understand and simple to implement, can help to promote energy access for urban poor populations.

- In India, Sulabh developed technologies that convert human excreta into usable biogas fuel. By creating a simple solution such as public toilets linked with a biogas plant and effluent treatment system, it completely recycled and reused human wastes and enabled biogas generation from human excreta to meet the energy needs (cooking, space heating and lighting) of the slum communities. Its uniquely designed community toilet complexes provided public toilet and bathing facilities at a low cost and converted the produced waste to energy. The case demonstrates the ability of a simple, financially sustainable model to produce clean energy that can be accessed by the urban poor communities.
- The improved cook stoves initiative in Bangladesh is a simple technological intervention that efficiently converts biomass into cleaner energy output as compared to the traditional cook stoves. The initiative helped promote clean and efficient energy conversion devices to the urban poor.

4 | Using Adequate and Appropriate Information

Information on energy poverty or the energy access situation of the urban poor can form a strong basis for energy service providers to facilitate clean energy access for these communities. The absence of real, up to date and quality information on energy access services becomes a barrier in seeking to promote services among the urban poor. Appropriate information can also facilitate targeted subsidies that would promote clean energy access. The cases demonstrate that when reliable and complete data or information is available and shared, it can drive supply, create demand and facilitate an understanding of the issues preventing sustainable, clean and efficient energy access among the urban poor.

- In Colombia, the existence of the Estratificacion Socioeconomica (ESE) classification system enabled properly targeted subsidies. This example demonstrates that where the appropriate information exists, it can act as an enabler to clean energy access[15].
- In Salvador, COELBA contracted an independent firm to conduct research into identifying the main characteristics of low-income clients and methods of intervention to promote legal

[15] However, the ESE classification system may not be up to date; and the method of targeting the beneficiary populations could be improved.

electrification. Crucial information with regards to household electrical consumption was discovered through the use of social surveys.

- In New Delhi, research conducted by INDCARE Trust formed the basis for the energy access project put forth by USAID and NDPL.

Sustainability and Replicability of Energy Access Initiatives

Sustainability and replicability of energy access programs documented in this study appear to have been driven by several factors, including: the willingness of stakeholders to carry forward these programs; a conducive policy environment for implementation; and establishment of mechanisms that facilitate convenient energy access (whether in terms of payments, provision of livelihoods and accessing infrastructure).

1 | Willingness of Stakeholders to Continue The Projects

- In Ahmedabad, when the pilot phase ended in 2004 and the USAID grant period ended, the slum electrification program continued. The role of the NGOs SAATH and MHT gradually diminished as Ahmedabad Electrical Corporation (AEC) took charge of the program. By 2008, the project had scaled up to include all the 710 slums in the city. The replicability of slum electrification was possible due to the willingness and commitment of the service provider to continue the services.
- Similarly, in Salvador, the service provider COELBA has expanded the electrification program to other households within the city.
- In Bangladesh, VERC invested in the community by building local knowledge and capacity to facilitate the improved cookstove's development and commercialization. VERC continues to address queries and offer advice regarding ICS, and manages the micro-credit fund for entrepreneurs to provide new loans.
- The Bangladesh MRD case was propelled by TOTALGAZ.
- The Sulabh model is driven by the Sulabh International NGO and its mission to promote clean energy in relation to improved livelihoods for urban populations. The model has been successfully replicated in India and other countries.
- In Mumbai, the community's initiative drove the project towards successful and spurred demands for replication. Several neighbouring communities in the city were motivated by the experiences of the Byculla area pavement dwellers have successfully gained access to legal electrical services.
- The role of collaboration was highlighted in the case of New Delhi, where despite the willingness of the NDPL, INDCARE trust was unwilling to further carry out the project. This ultimately resulted in a lack of replication.

2 | Enabling Policy Environments

- In Brazil, the existence of a social tariff program by the government helped overcome affordability issues faced by the community. The social tariff was formulated as part of a 2002 Electricity law and mandated a fee schedule based on consumption and set at the national level

instead of companies. This tariff incentivized companies to explore ways of extending energy access services to low income residents thereby helping to improve their quality of life.

- In Mumbai, amendments to the city's Slum Act in 1995 resulted in the establishment of a Slum Rehabilitation Authority. This provided due recognition to the urban poor communities and helped create a policy mechanism to address their needs for basic services.
- In Colombia, recent efforts led by the government at targeting the needs of urban poor populations facilitated the required knowledge to enable and effectively promote natural gas services to the urban poor.

3 | Establishment of Mechanisms to Ensure Continued Energy Services

Financial and institutional mechanisms were crucial means of sustaining continued energy access from the supply as well as demand sides.

- In Ahmedabad, community metering and monthly bill payment mechanisms were established to sustain energy service provision by the utility. Bill collection units were set up at post offices and stores to facilitate convenient payment by the community.
- In Colombia, monitoring and control mechanisms such as the output based-aid controls permitted verification and certifications of new energy connections. This enabled evidence based disbursement of funds for the continuation of the energy access program.
- The Sulabh, Bangladesh ICS as well as MRD cases demonstrated the importance of financial self-sustainable models and mechanisms to ensure continuity of energy services. Equipping individuals with new skills, increased their sources of income. The commercialized cook stoves facilitated community-buy and increased community sources of income. The MRDs and the Sulabh model enabled new livelihood opportunities besides providing energy access.
- In Mumbai, recognition of appropriate institutional arrangements helped to ensure the program's sustainability over time.
- In Salvador, an established fund between the service provider and community via the community agents helped sustain the initiative.

CONCLUSIONS

An analysis of the factors preventing energy access for the urban poor reveals several common barriers across cases - lack of affordability, illegal tenure, lack of education and awareness - among others discussed in the above section.

Overcoming these barriers is an important step in the process of gaining energy access for low-income populations. Community empowerment, and engagement of key stakeholders was important for successful negotiations between all parties. The continuity, replicability and sustainability of such programs were also contingent upon the establishment of appropriate mechanisms as well as a willingness of stakeholders to continue providing the energy services.

Whether in Colombia, Brazil, India or Bangladesh, the cases documented in this report have demonstrated common barriers - as well as factors - that enabled access to energy services for urban poor populations. The case studies have also highlighted the factors that can lead to replicability and sustainability of these programs. This type of documented evidence is a crucial basis for targeted, informed policies to address the needs of urban poor populations across the developing world.

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ANNEX 1 | THE AHMEDABAD SLUM ELECTRIFICATION PROJECT

Snapshot

TITLE OF INITIATIVE	THE AHMEDABAD SLUM ELECTRIFICATION PROJECT
Objective	To develop a private sector-civil society partnership in order to extend legal and reliable modern energy services to slum communities in Ahmedabad
Region	South Asia
Country: City, State	India: Ahmedabad, Gujarat
Urban Poor Area	Initially the programme was launched in five beneficiary slums of the Slum Networking Project of the Ahmedabad Municipal Corporation. While these five slums were primarily situated in the oldest part of the town (near former factories), gradually the project was extended to all the slums of Ahmedabad.
Duration	2001–08
Key Stakeholders	• Ahmedabad Municipal Corporation[16] • Torrent Power[17] or the Ahmedabad Electricity Company Limited (AEC) • United States Agency for International Development (USAID)[18] • Gujarat Mahila Housing SEWA Trust (MHT)[19] • SAATH (NGO)[20]
Current Status	Completed. By 2008, all 710 slums in Ahmedabad were electrified. To date, all slum dwellers in Ahmedabad, totalling over 200,000 households, have gained access to legal electricity connections. They receive and pay electricity bills on a monthly basis. The bills are routed through regular collection centres set up by the utility in the city.

Background

Ahmedabad, the biggest city of the state of Gujarat, is located on the bank of River Sabarmati. The city is well connected by rail, roads, and airways with all the important cities of the country. It is India's seventh largest, with an area of 190.84 sq. km. and a population of 2.877 million, according to the 1991 Census.

The origin of the slum electrification project dates back to 2001. In 1998, the Ahmedabad Municipal Corporation (AMC) had initiated Slum Networking Project (SNP) called *Parivartan*[21] with a view to providing physical infrastructure to the slums including sanitation, road, and water facilities. Under the

16 The Ahmedabad Municipal Corporation (AMC), established in July 1950 under the Bombay Provincial Corporation Act, 1949, is responsible for the civic infrastructure and administration of the city of Ahmedabad.

17 AEC Limited is an India-based company engaged in electricity generation, transmission, and distribution. Its current operations are in the states of Gujarat and Maharashtra. The company is the sole distributor of electricity to consumers in the cities of Ahmedabad, Gandhinagar, and Surat.

18 The United States Agency for International Development (USAID) is the United States federal government agency primarily responsible for administering civilian foreign aid.

19SEWA is a trade union registered in 1972. It is an organization of poor, self-employed women workers, and its main goal is to organize women workers for full employment. Its one-stop, integrated services reach over 100,000 slum dwellers in Ahmedabad, and many more in the Indian states of Gujarat and Rajasthan.

20 SAATH is a non-governmental organization registered as a public charitable trust in Gujarat, India. In Gujarati, the word SAATH means 'Together/co-operation/a collective or support'. Since 1989, SAATH has facilitated participatory processes that improve the quality of life for the urban and rural poor.

21 'Parivartan' in Hindi and Gujarati means 'transformation'.

Parivartan programme, slum households were provided toilets, sewage, and water supply connections. In addition, street lights were installed, paved roads were constructed, and storm water drainage and solid waste management facilities were provided to the slum areas (Joshi and Brahmabhatt 2005).

Two local NGOs, SAATH and Mahila Housing Sewa Trust (MHT), supported the AMC's project. The NGOs spearheaded the work and mobilized the beneficiary communities. While the community contributed Rs. 23,100,000 ($ 513,333.3)[22] to enable the provision of these basic services (Joshi and Brahmabhatt 2005), the AMC provided non-eviction certificate to each house for 10 years as a pre-requisite for access to these services and a motivation to the community to invest in their homes.

The project helped improve the living conditions of the slum dwellers and inculcated in them a sense of trust towards the authorities. The AMC, on the other hand, realized that even slum communities were willing to pay for services if they were provided quality infrastructure and services.

After the success of the slum networking programme, the beneficiary slum communities demanded electricity connection, which served as the first stepping stone in the initiation of the slum electrification project.

The activities under the project can be categorized into two distinct phases. The first is the pilot phase of the project, which involved multiple stakeholders and laid the foundation for the final phase of the project, namely, electrification of all the slum households in Ahmedabad.

The electrification programme was facilitated by two non-governmental organizations— SAATH and MHT—already involved in slum upgrading programmes in the city. They approached the Ahmedabad Electricity Company (AEC) and others to launch the slum electrification programme named '*Tatkalik Ane Saral Vij Jodan Yojana*'[23].

As a result of these efforts, in 2001, a pilot project was launched in five beneficiary slums of the Slum Networking Project by the Ahmedabad Municipal Corporation, in collaboration with USAID, which provided financial support for the pilot phase.

Both the NGOs—SAATH and MHT—rendered strong support to this programme. MHT worked with three slums, namely, Jaishakti Nagar, Kailash Nagar, and Shaikh Khan Pathan ni Chali; while SAATH worked with an additional two slums, Gupta Nagar and Praveen Nagar. The initial grant from USAID enabled electrification of 700 households, out of which MHT worked with 300 households. Electrification for the rest was facilitated by SAATH. During the pilot phase, each electrified household was provided with a legal, private meter and a compact fluorescent bulb.

The first grant enabled electrification of 700 households. USAID extended a second grant to electrify an additional 2000 households. The funds were used to provide subsidized electricity connections that lasted for about three years (2001–03).

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22 $1 = INR 45
23 Translates to 'immediate and easy electrification programme'.

In 2004, as the pilot phase ended and the USAID grant period came to an end, the slum electrification programme continued and the dynamics of the process of electrification changed. The role of SAATH and MHT gradually diminished as AEC took charge of the programme. By 2008, the project had successfully scaled up to include all the 710 slums in Ahmedabad.

Project Description

The objectives of the project were to: ensure safe and legal electricity supply to the slums; minimize the connection time and establish a bill recovery system; eliminate unauthorized connections and regularize existing connections while reducing the techno-commercial losses; involve community participation in the supply of bills and the recovery of dues by setting up CBOs; and develop strategies to scale up the project

In the pilot phase, the project targeted five slums, situated primarily in the oldest part of Ahmedabad. Eventually, however, the programme was scaled up to electrify over 700 slums across the city.

In 2001, USAID approached AEC with the proposal of introducing the concept of community meters. NGOs coordinating the *Parivartan* programme and familiar with the attitudes of the slum dwellers informed AEC that the concept of community meters is unlikely to be successful in the slums, since it was primarily a western concept. The NGOs then discussed the utility of using community meters with the slum dwellers. After consultation, the NGOs informed AEC that the slum dwellers were not ready for the community metering system, but were, nonetheless, interested in gaining access to independent electricity connections. Further to the NGOs expression of interest on behalf of the slum dwellers for regular individual electricity connections, USAID collaborated with AEC as a financial partner to launch a pilot electrification programme in a sample of five slums. The slums considered for electrification under the programme were the ones which had already been upgraded under the *Parivartan* programme. The pilot phase provided subsidized connections to about 700 households. Each household was provided with a legal private meter and a compact fluorescent bulb. The cost for connecting the customer and installing internal wiring was split between the household, USAID, and AEC.

The AEC's slum electrification project team worked with non-governmental organizations (SAATH and MHT) in announcing the programme via megaphone, cloth banners, and handbills distributed door to door. In each of the identified slum areas, they arranged group meetings with the community-based organizations (CBOs) that had been set up by AEC to facilitate the programme.

The AEC provided onsite services to receive applications, accept payment of service line charges, and answer consumer inquiries. Women played a prominent role in the NGOs and CBOs, and therefore, had significant influence on programme design and implementation. For example, the non-governmental women's organization MHT campaigned for houses to be registered in women's names so that they could not be evicted from the premises—a practice that had become rampant in some of the slum communities. The project thus enabled increased visibility of women, both as electricity consumers and citizens of the society.

The AEC employed door-to-door marketing techniques to acquire new consumers. It involved *anganwadis*[24] to educate people and bring more consumers into the fold. Several innovative social techniques were used to encourage more people to get legal electricity connections including offering gifts to girls' schools, distributing goodies to slum dwellers on local festivals and events like *Diwali*[25], organizing social get-togethers and parties to build rapport, and organizing road shows to generate awareness.

After the pilot phase, USAID provided additional grant to electrify another 2,000 slum households. This objective was accomplished by the end of 2003. At this point, USAID's collaboration with the project came to an end. The role of the NGOs and CBOs also gradually diminished as AEC took charge of all the activities of the project. By 2006, AEC had electrified over 115,000 households; and by 2008, the programme had enabled electrification of all the 710 slums in Ahmedabad. At present, all the slums in Ahmedabad are electrified, with over 200,000 households having access to electricity.

The detailed functions of the key processes of the project—metering, billing, and collection—that enabled the execution of the targeted activities under the project are explained in the following section.

Metering: In the initial phase of the project, meters were installed inside the houses of residents. However, it was soon realized that this posed problems for those responsible to read the meter. Women of the households went to work and thus, the meter reader often went back from houses that were locked. These houses also did not have addresses for the electricity bills to be posted to them. AEC, therefore, revised its strategy and started installing the meters outside the houses. This facilitated more efficient and comfortable meter reading, and reduced the incidents of tampering. Later, as the benefits of installing the meters outside were realized, the practice was extended to the entire city of Ahmedabad. While in the early days of the project, the meters were left uncovered, later on the meter boxes were designed to cover the meters to protect them from rains, tampering, and so on.

Billing**:** AEC initially delivered bills on a bi-monthly basis, but soon found out that the slum dwellers were finding it difficult to pay as the practice was imposing financial burden on majority of the people. To address this issue, the NGOs involved in the project (SAATH and MHT) persuaded AEC to issue monthly bills to the slum households. The AEC also revamped its existing software to enable generation of bills on a monthly basis. This practice has continued ever since, and to date all the slum households receive monthly bills, unlike other parts of the city that receive electricity bills on a bi-monthly basis.

Collection: The bill collection strategy employed in the project played a crucial role in its overall success. In the pilot phase, collection was facilitated by the local CBOs working in the project areas. Upon completion of the pilot phase, AEC, while maintaining the existence of the CBOs, introduced various other convenient means to enable people submit their bills. This involved setting up bill collection units in CBO offices, post offices, panchayat office, gas agency's offices, civic centres, and so on—all of which offered space free-of-cost to AEC. Mobile bill collection centers were also started. These were essentially AEC vans that visited slum localities, thereby making it convenient for the slum dwellers to pay their electricity bills.

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24 A government-sponsored childcare and mothercare centre in India, started by the Indian Government in 1975 as part of the integrated child development services programme to combat child hunger and malnutrition.
25 Diwali is an Indian festival that involves the lighting of small clay lamps (*diyas*) filled with oil to signify the triumph of good over evil.

Challenges Encountered

Initially, AEC was apprehensive about the programme. It resented the idea of providing electricity connections to slums, fearing that the residents might not pay the bill, and would try to claim tenureship on the basis of these bills. They were also concerned that immigrant Bangladeshi citizens might try to claim citizenship on the basis of a regular electricity connection.

The slum dwellers faced the challenge of adapting to the change that ensued with the availability of electricity. Many slum households had already acquired illegal electricity connections. For such connections, they paid only Rs. 50 (approximately $ 1) for each point in their house. For example, if a house was operating two bulbs and one fan it had to pay Rs. 150 (approximately $ 3) flat, irrespective of the total consumption. Since most households had developed the habit of consuming electricity at such cheap rates, there was a prevalence of extremely energy-inefficient practices in the households. For instance, most houses had lights and fans on throughout the day. When the legal connection was provided and the first bill showed that the slum dwellers had to pay approximately Rs. 200–250 per month ($4.50–5.50), they resented the high cost. It was soon realized that to ensure the project's success, slum dwellers had to be made aware of the nuisances and risks of illegal connections, as well as the benefits of legal and regular electricity supply. Furthermore, the need for training in energy-efficient lifestyle practices was identified. To address this matter, training programmes were designed and conducted for the slum community by the NGOs to educate the residents about the benefits of legal electricity connections and train them in energy-efficient practices.

Key Players and Their Roles

The following played crucial roles in the project:

- Ahmedabad Municipal Corporation (AMC)
- Ahmedabad Electricity Company Ltd (AEC)
- United States Agency for International Development (USAID)
- SAATH
- Gujarat Mahila Housing SEWA Trust (MHT)
- Community and the CBOs [26]

The roles and responsibilities of various agencies involved in the initiative are summarized in the table below:

26 Community organizations (sometimes known as community-based organizations) are civil society non-profits that operate within a single local community. They are essentially a subset of the wider group of non-profits. Like other non-profits, they are often run on a voluntary basis and are self funding entities.

Annex Table 1.1 | Roles and Responsibilities

	Key player	Role	Description
1	Ahmedabad Municipal Corporation (AMC)	Provided a legal framework to facilitate electrification in slum areas	• Provided a no-objection certificate to the area covered under the slum networking project • Provided a permanent road opening permission especially for electrification in the slums
2	AEC Ahmedabad Electricity Company Ltd (erstwhile, AEC)	Lead project coordinator and supplier of electricity. It has been the primary player from the inception of the project in 2001 till date	• Prepared technical layout • Released legal supply after obtaining legal documents and receipt of necessary fees • Provided check meters at source points (later, in phase II, the check meters were withdrawn after the digital meters were installed) • Monitored consumption patterns and identified pilferage • Established metering and bill recovery system • Coordinated slum awareness campaigns • In 2004, AEC carried out the slum electrification program and a massive drive against illegal connections. The project involved identification of slum areas, resource planning with a target to release connections within 30 days, establishment of simple and fast processes such as a single window concept, fixed initial connection charges, instalment payment, monthly meter reading and billing, aggressive marketing and campaigning, and opening of site offices at strategic locations. Over 200,000 slum households today pay for electricity with the business house, AEC, that has reported a 30% reduction in losses.
3	USAID	Provided finance during the pilot phase of the project. USAID association with the project lasted from 2001 to 2003	• Financed new connection cost • Enabled flexible billing options (monthly/ fixed) during the pilot phase by providing financial support • Encouraged energy conservation/energy-efficiency measures(by providing CFL bulbs) • Generated community awareness by bearing the community training costs
4	SAATH and Mahila Housing Sewa Trust (MHT)	SAATH and MHT were the two key facilitators of the project. They acted as intermediaries between AEC, AMC, and the slum dwellers. Their role, though of prime importance in shaping the project, was essentially restricted to the pilot phase of the project, which was completed in 2003.	• Obtained legal documents from AMC • Facilitated the process of submission of applications for electrification to AEC • Collected dues from slum dwellers on behalf of AEC • Identified CBO group and provided necessary support • Established metering and bill recovery system • Trained CBOs in bill collection system • Educated CBOs and slum dwellers • Influenced policies within the AEC for up-scaling the programme on the basis of the lessons learned from the pilot • Note: SAATH filed a PIL[27] to the High Court against the law that prohibited provision of services to areas that do not have building permission. The High Court clarified that slums do not need building permission to obtain access to services.

[27] In India, public interest litigation (PIL) means for the protection of public interests. It is the power given to the public by courts through judicial activism.

	Key player	Role	Description
5	CBOs[28]	The primary communication agents—facilitated communication between the utility and the community. Setting up CBOs enabled community participation and allowed AEC to monitor the supply and consumption of electricity in the slum areas better.	• Conducted home visits and organized street meetings/shows to create awareness and motivate slum dwellers to acquire legal electrification • Checked the reliability of billing system once every month • Collected the dues from the slum dwellers on behalf of AEC and the NGOs • Submitted applications to the AEC on behalf of the slum dwellers • Monitored any type of pilferage of electricity

[28] CBOs consist of 9–12 women in one CBO *mandal*. MHT trains these ladies. About 10–12 types of vocational training are offered to these ladies to make them self-reliant.

Project Implementation

Regulatory and institutional arrangements

After the earthquake in Bhuj (Gujarat) in 2001, several measures were taken by authorities to ensure less damage caused to buildings during natural disasters. In 2002, it was made mandatory for all households to obtain building permission in order to gain access to basic services like electricity. SAATH filed a public interest litigation (PIL) to the High Court against the law that prohibited provision of services to areas that do not have building permission. In response, the High Court clarified that slums do not require building permission to obtain access to services.

However, AEC had established certain mandatory prerequisites for obtaining a new electricity connection. These included records demonstrating the legal ownership of land, the latest copy of property tax bill, and ration cards as proof of residence. These requirements were seen as difficult to meet, as the slums were not authorized and most dwellers did not have security of tenure.

To resolve this issue, the two NGOs pursued AEC and AMC to reach a consensus to provide an alternative solution to this problem. They did so by asking AEC to relax the law, and requesting the AMC to ensure that slum dwellers are not evicted from their place of residence for a period of 10 years. The NGOs were effective in persuading AMC and AEC in this regard. This was because both SAATH and SEWA had worked in Ahmedabad for many years and were trusted by the government and citizens alike.

Thus, the positive reputation of the NGOs, combined with the rapport they shared with the slum dwellers as a result of their efforts in the Parivartan Programme, resulted in AMC granting the non-eviction certificate to the slum dwellers, and AEC relaxing the law and thereby enabling larger number of slum dwellers to meet the stipulated requirements for gaining access to electricity

AMC was already providing water and sanitation facilities to the slum dwellers under the Parivartan programme, and owned the land on which the slums were built. To facilitate electrification, AMC passed a resolution in the standing committee to allow non-eviction of the slum dwellers for 10 years from their places of residence. The standing committee approved the resolution, which was then passed by the General Board of the Municipal Corporation. According to the resolution that was passed, AMC agreed not to evict the slum dwellers for a period of 10 years, and in case they did so, then they would provide them new houses.

Since it was felt that such an arrangement was not possible for every slum of the city—and AEC eventually wanted to scale up the programme to the entire city—provision for an indemnity bond was introduced in phase II, which every household was required to sign. The indemnity bond ensured that at any later stage the slum dweller could not claim tenureship on the basis of the bills and the connection itself. It also stipulated that the signee would acquire the connection at his/her own risk. AEC, however, introduced a clause that if a person leaves his place of his residence or withdraws the connection, then the entire cost of the connection would be refunded, subject to the condition that he/she withdraws within one year of acquiring the connection.

Financial Arrangements

Connection charges in pilot phase

During the pilot phase, the normal rate (applicable for the rest of the city) for providing electricity connections varied from Rs. 4,000–6,000 ($ 91–136). AEC provided connections at the rate of Rs. 2,170 ($ 49), and the rest was subsidized by USAID. The uniqueness of the financial arrangement lay in AEC's experimentation with the degree of subsidization of the connection fee. The utility conducted an ability-to-pay survey to help determine the level of subsidies. Later, on demand from the CBOs, AEC also started providing connections to the needy (widows, very old, and retired individuals) at a subsidized rate cost of Rs. 1,700 ($ 38). The CBOs helped AEC identify and target needy families.

Loans offered for connection costs

SAATH and MHT both facilitated the process of availability of loans through SEWA Bank for payment of one-time connection costs by the slum dwellers. The origin of the SEWA Bank dates back to 1974. A group of self-employed women formed the Self Employed Women's Association (SEWA) in 1972, which was registered as a trade union in Gujarat. Its main objective was 'strengthening its members' bargaining power to improve income, employment, and access to social security.' It was 'a bank of the poor women.' The notion of 'We may be poor but we are so many', led to about 4,000 women coming together to contribute a share capital of Rs. 10 ($ 0.22) each to establish the Mahila Sewa Co-Operative Bank. The SEWA Bank was registered as a co-operative bank under the dual control of the Reserve Bank of India and the state Government. Since its inception, it has been providing banking services to poor, illiterate self-employed women, and has evolved into a viable financial venture. SEWA provided loans to its members who wanted electricity connections under the slum electrification project in Ahmedabad. By 2007–08, SEWA Bank's membership had grown to 30,755.

SEWA Bank and SEWA partnered with AMC under the Parivartan programme, which was designed to upgrade the slums in the city. Slums located on municipal land were first identified, then SEWA mobilized the women slum dwellers to form a residents' association. Every household deposited Rs. 2,100 (approximately $ 47) with the municipal corporation, which entitled them to a toilet, a sewage system, and water supply in their new *pucca*[29] houses. The women were provided loans from SEWA Bank if they were unable to pay with their savings. The entitlement to the house was issued in the SEWA member's name, and was entered into the official municipal record. Local SEWA leaders played a significant role in this regard. SEWA Bank offered to provide loans to its members for the electrification programme as well. An account holder with the bank was required to save money for a minimum period of six months to be eligible to receive loans from SEWA Bank. The loans were offered at an interest rate of 18%. In the slums where SAATH was functioning, a Sakhi Credit and Cooperative Society was opened, which offered loans to households at the same rate of interest. Each household availing of the loan was required to repay in a year's time.

[29] In Hindi, the word *pucca* means solid or permanent.

Connection charges beyond the pilot phase

Upon completion of the pilot phase, AEC adopted the practice of calculating connection charges on the basis of the distance of the household from the main supply line. This helped them work out the length of cable required and other associated overheads. In the post-pilot phase, AEC offered a connection charge of Rs. 5200 (approximately $ 116) for new connections in slums. Later, when more people came forward to acquire connections, the amount was reduced to Rs. 3700 (approx. $ 82). Eventually, it was reduced further to Rs. 2500 (approximately $ 56). When a number of poor households expressed their inability to pay the one-time connection cost, AEC introduced a system where in, during the time of the connection, the household would need to pay only Rs. 560 (approximately $ 12), while the rest of the charges would be deducted from their monthly bills. Hence, the rest of the amount was divided into 10 instalments, which were recovered on a monthly basis from the respective households' electricity bills.

Capacity building, skill building, and training of local community

In the pilot phase of the project, the NGOs conducted awareness programmes to educate the slums dwellers on the benefits of:

1 | Regular electricity supply over intermittent and unreliable supply that they were accustomed to before the programme;

2 | Use of power points, which could allow households to use electrical appliances like coolers, TVs, sewing machines, and so on; and

3 | Copies of electricity bill, which would provide households with an identity and residence proof, thus enabling them to also gain access to other benefits like obtaining gas connections, and so on.

Specific training programmes were also conducted for women to train them on energy-efficiency measures as means to keep the household electricity bills in check.

Innovative approaches

To arrive at an optimum connection fee, AEC experimented with the degree of subsidization of the connection fee. SAATH conducted an analysis of connection fees and the number of households willing to connect at different levels. This was done with a view that the programme required some payment by the recipient household for the connection costs, in order to ensure that the improvement would be valued when the consumer makes an investment. But, the stakeholders involved also acknowledged that the considerable upfront payment could pose to be difficult for the extremely poor households. Through their study, SAATH found an optimal point, where above a certain fee-level, likely participation began to drop off steeply. It was found that these households were able to manage the subsidized connection fee best only when the electricity company or the NGO intermediary made it possible for the households to pay the bill over time. This observation led to the advent of the instalment mode of payment.

Results and Impacts

Five slums, covering 700 households, were electrified under the pilot programme. At the start of the project, AEC faced average losses of 27%. The losses were significantly reduced upon completing the pilot phase. Incidences of electricity theft also fell, while regular electricity use increased with reported increase of 200% in average electricity consumption per day.

After the success of the pilot project in the Slum Networking Project (SNP) slums, AEC started issuing indemnity bonds specifically to undertake slum electrification in non-SNP slums, thereby making electricity accessible to more households. Till date, all the slums in the city of Ahmedabad have been electrified, with over 200,000 households having legal electricity connections.

Specific benefits to the various players involved

AEC | Reduced service costs and incidences of theft with dedicated slum personnel and use of appropriate technology such as standard meters, wiring kits, and underground service drop. The practice of installing meters outside the houses was extended to the entire city, following its immense success in the slum areas. Therefore, it may not be wrong to state that the project enabled AEC to learn new lessons from its own practices

The community, however, received several benefits. The electrical collections brought comfort and safety to the lives of the slum dwellers, and resulted in overall improved quality of life. This helped increase the productivity level of residents of slums and had a positive impact on their health. Electrification enabled a more comfortable environment for children to study and families to live in, and allowed access to various electrical appliances.

Facilitation in payments was affected through subsidized costs of connection and availability of loans through a CBO bank for the rest of the connection costs. The community usually received upgrade of other services in advance or simultaneously, including provision of infrastructure such as replacement of internal wiring and efficient lighting.

Monthly bills act as a proof of residence, while the legal electrification served to integrate the slum dwellers in the social and economic fabric of the city. Finally, it also helped promote gender equity. In the slums where MHT was facilitating the project, connections were issued in the women's name, which enabled these women to gain greater visibility—both as citizens of the society and as electricity consumers.

Enabling Environment and Barriers

There were three main barriers at the beginning of the electrification programme. First, the slums did not have legal status and security of tenure. Second, they faced limited access to finance/loans to pay for connection costs. Third, there was a lack of trust between the electricity company and the slum dwellers about the regular collection of bills.

The role of the two NGOs was significant in creating an environment of trust, and building consensus on the issue of how the programme would proceed through various stages of implementation. Their

deliberations with AMC helped in obtaining the non-eviction certificates for 10 years that enabled the electricity company to provide electricity connections. Financial aid from USAID, loans from the SEWA Bank, and subsidies provided in the second phase by AEC all helped the slum dwellers pay for electricity connections. The campaigns organized by the CBOs and NGOs and later by AEC helped build trust amongst the authorities and the slum dwellers.

Key lessons, Continuity, and Replicability

This case is an example of successful community mobilization and public-private partnership (PPP). While the adoption of a multi-stakeholder approach offers a useful model for analysis and replication, the key lesson that can be drawn from the study is that government rules can be relaxed for the common good. Also, the case brought to the fore the fact that poor communities are willing to bear the cost if a quality and reliable service is provided to them.

All slums in Ahmedabad have electrical connections, with over 200,000 households enjoying regular electricity connections. The NGOs and CBOs played a significant role throughout the project not only in mobilizing the community, but also in helping the utility in implementing the project effectively. Particularly, their efforts in matters like filing applications, collecting connection costs, checking meter readings, collecting bill payments and so on, and training the slum dwellers to use electricity judiciously, among others, deserve special mention. The NGO, SAATH, believes that slums do not require welfare schemes or subsidies. In fact, they should be treated as consumers. This was evinced through their participation in the electrification of the Ahmedabad slums. Although NGOs played a vital role in the pilot phase of the project, the ability of the utility to become self sufficient and take this project forward on its own without any intermediaries is equally remarkable.

This project is an example of a typical base-of-the-pyramid market where margins were low, but the spread of the project turned out to be very high. Recently, the Gujarat Electricity Regulatory Commission (GERC) and the Government of Gujarat have introduced a scheme for BPL families, which allows them relaxation from fees till the consumption of 30 units of electricity, after they produce their BPL card. The scheme has been launched in June 2010 with a view to provide electricity access to all.

The programme has the potential for replication with the involvement of local NGOs that can play a significant role in educating and mobilizing the community to partner with the government for similar projects. It has been reported that recently interest has been expressed in replicating the model of the project in Africa and Mumbai.

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ANNEX 2 | PROVISION OF ELECTRICITY TO PAVEMENT DWELLERS IN MUMBAI: AN URBAN POOR COMMUNITY'S INITIATIVE TO GET ENERGY ACCESS

Snapshot

TITLE OF INITIATIVE	PROVISION OF ELECTRICITY TO PAVEMENT DWELLERS IN MUMBAI
Objective	• Obtain legal, cheap, reliable, safe, and regular electricity connections for pavement dwellers in the Byculla area of central Mumbai • Establish a model for other pavement dwellers in the city of Mumbai to get electricity access
Region	South Asia
Country: city, state	India: Mumbai, Maharashtra
Urban poor details	There are an estimated 25,000 pavement dwellers in the city of Mumbai, a significant number of which lives in the Byculla area in the central part of the city.
Duration	1997–till date
Key stakeholders	• Beneficiaries: pavement dwellers • Community-based organizations (CBOs): Mahila Milan, National Slum Dwellers Federation (NSDF), and Sadak Chhaap • Non-governmental organization (NGO): Society for the Promotion of Area Resource Centres (SPARC) • Utility: Bombay Electricity Supply and Transport Undertaking (BEST)
Current status	In early 2000, most of the pavement dwellers in Byculla area were given access to legal electricity connections. Many other pavement dwellers of the city learnt from the Byculla experience, and followed a similar approach to gain access to electricity. There are several success stories in areas near Byculla.

Background

It is estimated that more than 25,000 families in Mumbai live on pavements; these poorest of the poor live in temporary shacks along roads. In the past, government development programmes have failed to acknowledge these pavement dwellers as part of the city. Since they were devoid of any legal recognition, no service could be provided to them under the policy of the state government of Maharashtra. Basic rights for pavement dwellers in Mumbai were not recognized until 1995, when amendments to the city's Slum Act were made. These amendments led to the establishment of a Slum Rehabilitation Authority in the city that was to formulate schemes for slum dwellers. This authority entitled pavement dwellers the right to be rehabilitated to other sites, as against their slum counterparts who were granted the right to resettlement at the same location provided the land was not required for public use. Further, the Municipal Corporation of Mumbai was providing services like water and sanitation to the slums. However, such facilities were not available to pavement dwellers, despite the fact that the Slum Act offered them some protection. They had the option of either living without any access to the basic services, or acquiring them illegally at much higher costs; this was the case for electricity services.

In 1995, about 80% of pavement dwellers in the city did not have access to electricity, while the remainder had access to illegal supplies by paying steep amounts. The illegal supplies were a result of a nexus between the lower staff of the utility and local 'leaders'. Pavement dwellers were forced to pay three times the actual cost of a connection every month as a result of this illegal arrangement. At the same time, the electricity supply company, the Bombay Electricity Supply and Transport Undertaking

(BEST) had its revenue stolen. Thus, with BEST facing problems of electricity theft by the pavement dwellers, they used to cut these illegal connections and fine the pavement dwellers[30].

Firstly, stolen electricity denied the poorest and most vulnerable section of the society a much-needed amenity. Secondly, there needed to be some kind of institutional reform to address the stealing. Thirdly, there was an urgent need to explore ways to develop inclusive arrangements that addressed safety issues, fires, and electrical shocks due to faulty connections. In addition to illegal and unsafe connections, steep monthly charges, and stealing, the pavement dwellers also faced problems such as insufficient light, children finding it hard to study after dark, and lack of safety for women and girls.

Recognizing the difference in provision of electricity between slum and pavement dwellers, the pavement dwellers, along with local CBOs and an NGO started their quest to obtain legal, regular, and cheap electricity connections for pavement dwellers living in the Byculla area in central Mumbai.

Project Description

The main objective of the initiative was to obtain legal, cheap, reliable, safe, and regular electricity connections for pavement dwellers in Byculla area in central Mumbai. The initiative also aimed to set a model for other pavement dwellers in the city to follow to procure access to electricity. A third objective was to build relations between the pavement dwellers and the authorities.

Since 1986, pavement dwellers in Mumbai have struggled to get recognition from city authorities supplying basic services. While amendments in the Slums Act have been instrumental in improving provision of basic services to slum dwellers, pavement dwellers in the city have found it exceedingly difficult to gain access to these services. Social exclusion and fear of demolitions promoted the pavement dwellers in the Byculla area in Central Mumbai to raise their concerns to the city authorities. In 1985, SPARC and the pavement dwellers got together to conduct a Census, which revealed that more than 60% of these households were residing in Mumbai for over a decade, thereby nullifying the notion that pavement dwellings are temporary forms of residence of immigrants to the city. Since then, community-based organizations such as Mahila Milan, NSDF, and SPARC have been working together to improve the living conditions of these people. Under the name the Alliance, the three organizations have been working together in the Byculla area in central Mumbai since mid-1980s.

The process of acquiring legal electricity supply from BEST began in 1997 with the members of Mahila Milan initiating discussions on issues related to electricity supply. The members organized a number of sessions where they tried to analyse the entire range of issues, including purchasing 12-volt batteries that needed periodic recharging, buying electricity illegally from residents of *chawls* in the Byculla area at a cost of about Rs. 300 ($ 7) per month, buying wires to steal electricity from streetlights, and paying middlemen to illegally access electricity from street lights.

Middlemen used to command deposits for the night time supply of electricity, in addition to extra payment for occasional connections. They used to cut illegal connections claiming need for replacement of wires, for which the residents were charged extra. The pavement dwellers ended up paying up to Rs.

[30] It needs to be noted here that BEST had been supplying legal electricity to slum dwellers since the 1970s.

250–350 ($ 5–8) per month for their electricity supply, which proved to be expensive, inadequate, illegal, and unreliable.

After a series of meetings, the women of Mahila Milan clearly understood each other's problems related to access to electricity. They concluded that getting electricity from BEST directly would prove to be the ideal solution in terms of getting cheap, legal, reliable, and safe electricity connections. It took Mahila Milan more than two months to come to a consensus on approaching BEST. BEST's senior management and the alliance of SPARC, Mahila Milan, and NSDF agreed that it was an initial gesture symbolic of the spirit of 50 years of independence of India that pavement dwellers have access to electricity legally. They also agreed that no matter how long it takes, they would find a strategy to make this happen.

The initiative to obtain electricity from BEST can be divided into different phases. In the first phase, in mid-1995, the women of Mahila Milan applied for legal electricity connections by adopting standard procedures laid down by BEST. Their requests were turned down by BEST on the grounds of tenureship (type and place of residence).

Next, Mahila Milan approached NSDF and SPARC to get their help in approaching BEST. These two organizations were acquainted with a few senior BEST officials, and had already been successful in getting ensuring electricity connection for one of SPARC's night shelters.

Representatives of SPARC and NSDF met the General Manager of BEST to raise the following key points:

- Recognition of pavement dwellers through amendments in the Slum Act;
- Long duration of their stay in the city (tenureship); and
- Granting them legal electricity access

BEST officials doubted the feasibility of the request by pavement dwellers on account of their tenureship and the flexibility in BEST procedures to entertain such a request. However, the Deputy General Manager (Mr. Miller) of BEST agreed to look into the request.

After some signs of interest from BEST, women of Mahila Milan took over the negotiations along with NSDF members and a pavement dweller named Abdul Shakoor. They met with BEST officials to clarify all reservations. The key points raised by them included that pavement dwellers were not temporary migrants; that they were paying huge sums of money to get electricity connections illegally; and that they were willing to pay for legal electricity connections. In a positive outcome, BEST officials agreed to visit the pavement dwellers of the Byculla area.

Four months later, BEST officials visited Byculla. A committee had been set up (with core members from Mahila Milan) to work on electricity access issues that apprised the officials with the layout of the settlements and the illegal connections in the area. After their visit, BEST officials offered (only) a direct current (DC) electricity supply, which could power only one light. They declared the houses unfit for electricity provision on account of the flammability of the material used in their construction. The pavement dwellers, however, demanded more power for at least lights and fans.

BEST officials had concerns regarding the demolition of pavement dwellings, which might have led to losses to BEST in terms of cables and other infrastructure. However, a government letter declaring that these dwellings will not be demolished for the next one-and-a-half years following changes in the Slum Act turned out to be a reassurance.

The BEST officials also required a 'No Objection Certificate' (NOC) from the owner of the area where electricity was to be provided. When SPARC approached the Municipal Corporation for the same, they drew a blank. There was apprehension that NOC issuance in this case may be used as a precedent to obtain water and sanitation services by pavement dwellers in the city. At this point, Mr. Miller proposed that SPARC give an undertaking that BEST would be absolved of responsibility in case of any dispute with the Municipal Corporation. The undertaking also stipulated that the supply would be given only for as long as no demolition was planned, and also that SPARC would obtain the necessary permission. Finally, SPARC also signed an indemnity bond declaring that it had no objection to disconnecting the supply and removing the meters if the Corporation raised any objections, even if there were no violation of the Electricity Act and Rules. In this way, BEST was appeased that its supply of electricity to the pavement dwellers would neither place the company in breach of its own rules, nor would it be seen to symbolize de facto security of land tenure for the pavement dwellers. (Burra and Riley 1999).

Key Players and Their Roles

The key players in this initiative included

- Pavement dwellers
- CBOs: National Slum Dwellers Federation (NSDF), Mahila Milan, and Sadak Chhaap
- NGO: Society for the Promotion of Area Resource Centres (SPARC)
- Bombay Electricity Supply and Transport Undertaking (BEST)

A recurrent feature of the Indian metros, pavement dwellers live along the roadside by building shacks/hutments. Belonging to the poorest income categories, a majority of them are self-employed or casual labourers. Their income levels are much lower than the official poverty line. According to a survey conducted by SPARC, in 1998, about one-third of the pavement dwellers in Mumbai had been living in the city for 15 years.

The National Slum Dwellers Federation (NSDF), founded in the mid-1970s, is a national organization of community groups and leaders who live in slums and informal settlements across India. NSDF mobilizes the urban poor to come together, articulate their concerns, and find solutions to the problems they face.

Mahila Milan or Women Together is a decentralized network of poor women's collectives that manage credit and savings activities in their respective communities. Mahila Milan aims to provide a space for women to take on important decision-making roles and be recognized for their contributions towards improving their communities. It was formed in 1986 when hundreds of women who lived on Mumbai's pavements organized themselves to successfully prevent the demolition of their homes.

The Society for the Promotion of Area Resource Centers (SPARC) is one of the largest Indian NGOs working on housing and infrastructure issues for the urban poor. In 1984, when SPARC was formed, it began working with the most vulnerable and invisible of Mumbai's urban poor—the pavement dwellers. SPARC, NSDF, and Mahila Milan have forged an alliance and work together. The alliance has a fourth and younger partner known as Sadak Chhaap, which means 'the stamp of the street'. This is a federation of street children who live in Mumbai. The federation was constituted as a result of the work of SPARC, Mahila Milan, and NSDF in setting up night shelters.

The Bombay Electricity Supply and Transport Undertaking (BEST) supplies electricity to Mumbai. A municipal enterprise for more than 60 years, BEST also operates public transport (buses) in Mumbai. It is divided into two wings, namely, transport and electricity, for executing its functions.

Project Implementation

After various stages of negotiations and procedures that continued for about two years, BEST started installing electricity meters in Byculla in an identified pilot area. At this point, Mahila Milan convened a meeting of the pavement dwellers to apprise them about the work that BEST was to undertake, and cost the households would incur in the process.

The households were to ensure removal of all inflammable material from the houses and replace these with tin, wood or concrete. Earth leakage circuit breakers were installed to prevent electric shocks or fires. Additionally, BEST-approved cabinets were to be built in the houses for the installation of meters and mains wiring.

Innovative concept introduced

Mr. Miller proposed the concept of community metering (one meter for every 15 households). This approach was different from the traditional one of one meter per household. Since, Mahila Milan was not a registered organization, BEST decided to install meters in the name of SPARC, who was to receive all the bills of households.

The electrification work slowly extended to streets other than those of the pilot area. Many members of Sadak Chhaap had been living in SPARC's Byculla resource centre since the time they were street children. They got involved in the project and helped out BEST's licensed electricians. In return, the licensed electricians provided them with the necessary training to install the internal wiring in the pavement shacks. In this way, Sadak Chhaap's members were involved in internal wiring that led to a saving of 40% of the cost of installation, as compared to installation by licensed electricians. Following their work in the Byculla area, these individuals have worked as electricians in other SPARC projects in Mumbai and other Indian cities. Sadak Chhaap has been instrumental in providing internal wiring and reducing the cost of the same for the pavement dwellers.

Financial arrangements

The expenses for installing electricity connections were primarily borne by the pavement dwellers. The costs involved:

- Building cabinets for shared meters;
- Purchasing cables and safe building materials; and
- Internal wiring in the house

For cabinets, cables, and building materials, each household was to pay Rs. 1000 ($ 20), while for internal wiring the stipulated amount was Rs. 500 ($ 10). The Rs. 500 for internal wiring was taken from Mahila Milan's already established savings and credit scheme. The best quality cables were used to ensure safety. Mahila Milan also started registering electrical goods possessed by households, and began collecting money from them on a monthly basis, depending on their estimated amount of electricity consumption.

Regulatory and institutional arrangements

SPARC was the legally registered organization that was billed for the electricity. Mahila Milan groups would collect money from the residents and deposit it into an account from which the payments would be made. All organizations were in existence before the issue of provision of electricity was undertaken. They had representative leaders, a culture of savings groups, and an ongoing engagement with various government officials to address issues of their housing that lend them the capacity and confidence to undertake this initiative.

Results and Impacts

A field visit revealed that almost all households in the area were able to get electricity connections on time. Pavement dwellers in areas near Byculla were also able to get electricity access after following a process similar to that followed by the Byculla pavement dwellers.

The initiative has also led to a change in BEST's policy for electricity supply to urban poor, specifically the pavement dwellers. They recognized the entitlement of pavement dwellers to electricity connections. It is understood that to get electricity from BEST, pavement dwellers should approach it as an organized group, and should comply with their pre-conditions, following the precedence set by the Byculla pavement residents.

One of the biggest impacts of the initiative is that it put an end to stealing of electricity. As a result, efforts are being made to replicate this endeavour for other slum areas/pavement dwellers in Mumbai and other cities.

Specific benefits to pavement dwellers included regular and safe access to electricity and its use for lighting, which ensured safety for children, young girls, and women. Children who used to study under the light of lamp posts were now able to study at home. Furthermore, as most pavement dwellers carried out their income-generation activities from home, steady electricity supply allowed them to pursue such activities in the evenings as well.

A scheme titled 'Seema 97' was introduced that drew from the experience of the present case to include a provision to overcome the requirement for an NOC from the Municipal Corporation.

Enabling Environment and Overcoming Barriers

Several key elements were responsible for the success of this initiative. For instance, it was a community-based initiative—an initiative started by the community, who remained actively involved throughout the process. Moreover, the community was extremely well-organized in terms of groups and leaders.

An enabling policy environment provided by policy change in 1995 was instrumental in strengthening the case of pavement dwellers. The initiative of the community was backed by an NGO, which guided the community throughout the process and also got involved in the negotiations, planning, implementation, and monitoring of the project

The utility was ready to engage in a dialogue with the urban poor community on the issue of electricity connections, and was willing to work together with the community to come up with the best possible solution.

Cooperation by the community was instrumental behind the successful implementation and continuity of the initiative. An institutional setup, which included the community and NGO, was useful in the proper management and monitoring of the initiative.

Key lessons, Continuity, and Reliability

Several lessons can be drawn from this initiative at the Byculla area in Mumbai. First, urban poor communities have to organize themselves in a structured manner in order to gain access to services. Enabling policy environments are also required to achieve the desired objectives. In this case, a shift in policy environment in 1995 was instrumental in providing a powerful tool to the community.

In addition to policy environment, institutional set up, in terms of community-based organizations and non-government organizations, is helpful in approaching the service providers in a structured manner. As is evident from this case study, BEST trusted SPARC and was ready to install meters in their name. Also, it is equally clear that utilities are able to connect more easily to institutions rather than individuals.

Interventions of key officials of utilities—for example, Mr. Miller in this particular case—can be crucial in terms of entertaining the requests of a community. Local skill building can reduce costs of implementation, which is very important while providing services to poor communities. Such skill building can also provide livelihood opportunities to the local community.

The initiative at Byculla has been successful, with the households getting electricity supply on a regular basis. Households pay for the electricity consumption regularly, which has led to BEST's interest being maintained in continuing the electricity connectivity to these households.

Learning from the successful experience of their compatriots of Byculla, pavement dwellers in other areas have followed a similar approach, and have been successful in getting electricity connections. This fact was confirmed during the various field visits.

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ANNEX 3 | SULABH BIOGAS PLANTS FUELLED BY HUMAN EXCRETA

Snapshot

TITLE OF INITIATIVE	SULABH BIOGAS PLANTS FUELLED BY HUMAN EXCRETA
Region	South Asia
Country: city, state	India: Patna, Bihar; and New Delhi, Delhi
Urban poor details	Poor populations in these areas lack access to clean and affordable energy options, and hygienic sanitation facilities.
Duration	1982/1990s–till date
Key stakeholders	• Sulabh International Social Service Organization • Ministry of New and Renewable Energy, Government of India • The community that collects human excreta from houses (also known as 'scavenger') • Consumers of biogas
Current status	The project is currently ongoing. There are more than 100 biogas plants in operation across the country. As a result of the toilets and the biogas plants that are set up, the community benefits from clean and hygienic sanitation conditions, while getting access to a cleaner fuel for cooking and lighting.

Background

Lack of sanitation is one of the biggest concerns in India—a problem that does not spare even its urban population. According to the 2001 Indian Census, over a quarter of India's urban population is without a lavatory. Use of dry privies and open defecation are widespread. This lack of basic sanitation services causes many life-threatening diseases including intestinal, parasitic, and infectious diarrhoea, typhoid and cholera, among others. Traditionally, it has been the job of human 'scavengers' to collect excreta from houses, who then carry it on their heads, before disposing of it. Although the law prohibits the construction of dry toilets and human scavenging, approximately 13% of urban households in India continue to use toilets that require human scavenging.

The Sulabh sanitation movement was started by social activist Dr Bindeshwar Pathak, who has devoted nearly three decades of his life towards filling the void in the delivery of this basic service in India. The aim of the movement is to liberate the so-called 'scavengers', or 'untouchables'. Belonging to one of the poorest segments of the society, they earn their livelihood by cleaning toilets and manually disposing of human excreta.

The movement's name derives from the Hindi word s*ulabh*, which means 'simple' and 'uncomplicated'. As the name suggests, the uncomplicated solutions provided by the non-government organization (NGO) have had unprecedented impact on the lives of those people who lacked access to this basic

service. Alongwith providing basic sanitation services, Sulabh International Social Service Organization has pioneered the development of technology to generate biogas from human excreta.

Project Description

The main objectives of the initiative are:

1 | Provide clean and hygienic sanitation facilities to slum dwellers; and

2 | Provide clean energy to slums to meet their cooking, lighting, warming, and electricity generation needs.

The initiative also aims to free 'scavengers' from the plight of their job of collecting human excreta.

Sulabh has been implementing two technologies to improve sanitation facilities— one for household waste disposal through two-pit, pour-flush toilets, which do not require scavenging; and another for public areas and slums through public toilets linked with a biogas plant and effluent treatment system for the complete recycling and reuse of human waste. The focus of this case study is on the second technology, where biogas generated from human excreta has been used to meet energy requirements for cooking, heating, and lighting.

To ensure the safe disposal of human excreta, the Sulabh toilets are linked with a biogas plant in which human excreta and flush water are channelled for anaerobic digestion. The biogas plant was indigenously developed after an intensive research and development process that spanned over eight years. The designed plant has been approved by the Ministry of New and Renewable Energy (MNRE) of the Government of India. The design, known as the 'Sulabh Model' of biogas plants, does not require manual handling of excreta, and ensures complete resource recovery.

The biogas generated through this system has multiple uses, including cooking, lighting, generating electricity, and generating heat in the winter. The gas is supplied to the households through pipelines. The wastewater generated from bathing and washing clothes in the public toilets and bathing complexes is either collected separately and reused after sand filtration, or is discharged into a drain.

The first Sulabh biogas plant was set up in 1982 in Patna, Bihar, which at that time was one of the poorest states in India. Since then, Sulabh has constructed over 6,000 public toilet-and-bathing-service complexes at public places such as bus stands, hospitals, and markets, as well as in slums in different parts of the country. Sulabh provides its service to around 3 million people in 625 towns on a pay-per-use basis. Of these 6,000 public toilet-and-bathing complexes, 100 have biogas production facilities.

Another Sulabh complex is being operated at Mahavir Enclave, New Delhi. Here, the public toilet complex includes 13 water closets (WCs)—eight for men and five for women—that are linked to a biogas plant. This facility is used by around 600 people every day. The biogas generated is used for cooking, lighting mantle lamps inside the toilet complex, and to generate electricity. The treated effluence is used to irrigate a lawn and for horticulture. Sulabh maintains 294 toilet complexes in Delhi, out of which, it constructed more than 100. The remaining ones have been built by other agencies such as the Municipal Corporation of Delhi (MCD).

Key Players and Their Roles

The Sulabh International Social Service Organization has played a leading role in changing lives of many of the urban poor by providing cleaner services such as sanitation facilities and clean energy in the form of biogas.

MNRE has officially recognized the technology developed by Sulabh to manufacture biogas, and has named the system a 'Sulabh Model'. The Ministry provides financial support for implementation of the biogas plants

The beneficiary of this initiative includes consumers who have benefitted from the improved services. These consumers are also part of the financial model of the system. Another beneficiary group has been the so-called 'scavengers,' who have been trained by the professionals at Sulabh so that they can shift to better and more respectable livelihood options.

Local bodies such as the MCD also play a key role in maintaining and being responsible for clean sanitation facilities in the city. For instance, they outsource the operation and maintenance of public toilets.

Project Implementation

The three main aspects of project implementation included the technological innovation, creating a financial model to support the project, and facilitating capacity building of the employees to successfully run the projects.

Technological innovation

The Sulabh biogas plant is designed in such a manner that the excreta from the toilets flows underground through covered drains first into the inlet chamber and then into the digester. The digested slurry comes out through an outlet pipe, reaches the outlet chamber, from where it flows out through covered drains into soak pits. A large, round, air-tight manhole cover is installed at the top of the digester. The gas outlet pipe and safety pipe are attached to the manhole. Methane and a small quantity of carbon dioxide are produced as a result of the anaerobic breakdown of the mixture in the digester. The generated biogas is stored under the fixed dome by hydraulic displacement of the digesting slurry inside the digester, from where it is directed to burners or pipes. Alternatively, the gas can be stored in a separate drum, floating over water.

The generated biogas is used for cooking, lighting mantle lamps, producing electricity, and for heating requirements during winter. Biogas is mainly used for cooking using biogas burners that are available in a capacity range of 8–100 cft of biogas consumption per hour. It is a clean fuel that burns with a blue flame, and does not produce soot or odour. The biogas mantle lamp consumes 2–3 cft of fuel per hour, and has an illumination capacity equivalent to 40W electric bulbs operating at 220 volts.

Electrical power can be generated by using biogas in a dual-fuel internal combustion engine. According to estimates, a public convenience facility accessed by about 2000 people per day would produce approximately 60 m^3 of biogas a day, which is enough to operate a 10 KVA internal-combustion-engine-

based power generator for about eight hours a day, thereby producing 65 units of power (APEIS 2003). Initially, electricity was generated by using a mixture of biogas (80%) and diesel (20%). Today, engines can run on 100% biogas ignited by a battery.

Financing Model

There are two major costs to be borne for a well-functioning public toilet, namely, the construction cost and the operations and maintenance costs. For setting up its public toilets, Sulabh contracts municipalities and public sector providers to construct toilet blocks with public funds (UNDP 2006).

Sulabh employs one of the following three distinct models for their business. In the first model, it constructs and maintains community toilet complexes (CTCs) for public use on a pay-per-use basis. The land and funds for construction of public toilets-bath complexes are provided by the local bodies or any other sponsoring authority. Sulabh raises its resources by charging the sponsoring authority 20% of the project cost as implementation charges. The money collected is used for running the respective Sulabh facility.

In the second model, Sulabh takes over public toilet complexes from city officials for a contract period of 30 years, thereby relieving the municipal authorities of the task of operating and maintaining these complexes.

In the third model, Sulabh helps local organizations like temples, churches, schools, and hostels to set up, operate, and maintain CTCs that run on a pay-and-use basis.

Besides setting up public toilets, Sulabh extends its services and expertise across the country in constructing facilities for producing biogas from human excreta. It does not rely on external agencies for funding and meets all its financial obligations using internal resources. The toilet complexes in public places and in slums run on a 'pay-per-use' basis, where a nominal fee of Rs. 1 ($ 0.2) per use is charged from the users. All of the toilet complexes are financially self sufficient, especially those located in slums and less-developed areas. The maintenance of these toilet complexes is cross-subsidized by the income generated from the complexes in busy and developed areas.

Setting up biogas plants along with the Sulabh public toilets improves the financial viability of a toilet complex itself. However, the extent of financial improvement of the complex depends upon revenue generated from the sale of biogas. The economic benefit accruing to consumers can be measured in terms of the savings generated from using biogas to replace LPG or kerosene for cooking requirements or diesel to generate electricity.

Capacity Building of Employees

Sulabh has a solid work force, to which it provides training and capacity building to construct the toilets, CTCs, and biogas plants. A total of 50,000 volunteers work with Sulabh. They include technocrats, managers, scientists, engineers, social scientists, doctors, architects, planners, masons, and other non-revenue staff.

Sulabh trains officials not only in India, but also internationally. In 2005 and 2006, it provided training on sanitation technologies for capacity building in 14 countries, namely, Ethiopia, Mozambique, Uganda, Cameroon, Burkina Faso, Kenya, Nigeria, Senegal, Ghana, Zambia, Tanzania, Cote d'Ivoire, Mali, and Rwanda.

Upon request from the Kabul Municipality, Sulabh has set up five CTCs along with biogas facilities in Kabul, Afghanistan. The construction of these complexes has been funded by the government of India. Sulabh also trained personnel in the region to ensure smooth functioning of the facilities. The operations and maintenance cost of the facilities are being met by a similar 'pay-per-use' model that has been applied in India.

Results and Impacts

The model of a biogas plant with a public toilet system has benefitted the community in several ways. Firstly, setting up these public toilets has provided people with hygienic sanitation facilities. These cleaner arrangements are expected to have positive impacts on the health of the people, as opposed to the far-reaching negative impacts of open defecation practised earlier. There are about 6,000 CTCs that serve about 12 million customers on a daily basis. Moreover, these CTCs employ a workforce of 60,000 paid workers, and thereby help in employment creation as well.

Secondly, the biogas plant serves as a renewable energy resource, enabling people access to a clean fuel. This fuel has multiple uses as well as benefits. For example, biogas can be used for electricity generation, which is expected to improve energy access levels among the poor. It can also be used for heating requirements during the winter. Most importantly, however, biogas is a clean fuel for cooking.

Most of the poor in urban areas use kerosene or firewood to cook. However, both these fuels have severe health implications, because burning them causes indoor air pollution (IAP). Use of biogas helps address these concerns. The generated biogas can also be used for lighting purposes in the area, and is expected to improve street lighting, and thus lead to a more secure environment for the community.

Thirdly, the by-product of manure from the process to create biogas from human excreta is good for the soil. This manure is high in nitrogen and phosphorus and helps improve fertility of land. The facility visited by TERI that is maintained by Sulabh International also had an effluent treatment plant. It has been estimated that a public toilet linked to biogas plant that is used by over 1000 users per day generates approximately 5,000 litres of waste water on a daily basis.

Enabling Environment and Barriers

As a result of the scale of operations and the model adopted by Sulabh—wherein the local authorities/governments approach Sulabh for setting up the complex, and the land, too, is provided by the authorities—the organization does not face legal or regulatory bottlenecks while setting up the biogas plants along with the public toilets. However, it has been reported that one of the setbacks faced in extending its services to slums is the classification of slums as legal or illegal. Municipal authorities can, for instance, prevent extending these facilities to illegal slums (Hansen and Bhatia 2004).

Key lessons, Continuity, and Replicability

The Sulabh case highlights how simple technological innovations tied with a financial model and combined with able leadership can help provide better basic services to the poor. An NGO-driven initiative with limited support from the government, Sulabh's endeavours has successfully provided cleaner energy and sanitation facilities to the poor, who were earlier living in subhuman conditions.

The case demonstrates that a simple technological innovation, a financially sound model, and effective implementation strategy were the factors responsible for the success of the voluntary system set up by Sulabh. The organization and its projects run independently and do not rely on charity or external funds for operations. Such implementation lends credence to voluntary systems.

The Sulabh project is also sustainable, affordable, and replicable. The payback period of a biogas plant linked with a public toilet complex is 5–6 years. Since the toilet complexes are being run on a 'pay-per-use' basis, and given that at least two caretakers are stationed in the toilet for 24 hours, no additional manpower is required to operate the system.

The scope of replicating this initiative is immense, and there are a several factors to facilitate project replication. Technologies that are being implemented are simple and indigenous, and can be easily replicated. Sulabh has not patented any of its technologies, simply to ensure easy access to all of the technological innovations. The biogas plants have low operation and maintenance costs, while the on-site waste disposal technology can be replicated under various geological conditions.

The project is sustainable from the point of view of skill and capacity building of the locals. The local people are trained to implement the entire system, which makes the use of the system sustainable. This was highlighted in the case of the installation in Kabul in 2007. Since then, the facility is being run successfully by local personnel trained by Sulabh.

Biogas technology is simple and easily replicable in almost any region. The design is suitable even for areas that experience low temperature, because the plants can withstand temperature variation due to its underground structure.

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ANNEX 4 | SAFE AND LEGAL CONNECTIONS FOR CONSUMERS IN SLUM COMMUNITIES: A CASE IN NEW DELHI

Snapshot

TITLE OF INITIATIVE	SAFE AND LEGAL CONNECTIONS FOR CONSUMERS IN SLUM COMMUNITIES – A CASE IN NEW DELHI
Region	South Asia
Country: city, state	India: New Delhi, Delhi
Urban poor details	Approximately 45% of Delhi's population lives in unauthorized colonies, informal settlements or slums[31]. There are an estimated 1,040 such settlements in the city[32]. About 39% of slum dwellers of the 'Bhalla Factory' slum earn less than a dollar a day. Similar is the case for the neighboring 'Jaipur Golden' slum.
Objective	To facilitate safe and legal electrification in two slum communities through community education and microfinance in order to promote economic benefits aimed at women.
Duration	2004
Key stakeholders + roles	• Beneficiaries: Jaipur Golden and Bhalla Factory slums' residents • International organization and project funder: USAID • Pilot research funders: Department for International Development (DFID) and Gamos Pvt. Ltd • Community-based organization: Integrated National Development Centre for Advancement Reforms and Education (INDCARE) Trust • Utility company: North Delhi Power Limited (NDPL)
Current status	The project was completed in 2004.

Background

The project was undertaken in two slums located in north-west Delhi, India. The aim was to supply slum dwellers with safe and legal electrical connections in place of provisions by the local mafia, and encourage greater economic benefits.

A major problem identified in the target communities was lack of recognition of electricity as a basic need. Poor living conditions, combined with a lack of basic services like electricity, had resulted in widespread electricity theft in the slums. Illegal electricity connections that posed a safety risk and hazard were usually regulated by local mafia groups. Risks involved the connection being discontinued at anytime, combined with possibilities of fire and electrocution, which often result from unmonitored and illegal connections.

After having identified barriers of access to legal connections, the project was conceptualized as a means to overcome the challenges of illegal connections and promote the wider potential benefits of legal slum electrification. A pilot study implemented by the Integrated National Development Centre for

31Delhi Jal Board. 2002.

32 INDCARE Trust. **Steps towards slum upgrading by overcoming the barriers to access to electricity**. INDCARE Trust. [PowerPoint presentation].

Advancements, Reforms and Education (INDCARE) Trust had revealed a high percentage of slum households with illegal connections, amounting to electrical theft. Slum households were using energy irresponsibly. For instance, they were using electricity to cook because they were not the ones paying the bill (USAID 2006). The barrier appeared to be the steep cost ($ 34.50) of the initial connection, combined with the security deposit, which was high for their earnings (USAID 2006). As a result, fuel economics began to trump community safety as well as access.

The result of workshops and surveys conducted by INDCARE Trust and the community-based research showed a scope for NGO involvement to promote slum electrification in India. They revealed that people were willing to pay for these services, if they felt secure about their habitats and had a sense of tenureship.

In 2003, USAID Energy Team and Academy for Educational Development (AED) began working with the utility company, North Delhi Power Limited (NDPL). By then, the sector had become privatized and was faced with the challenge of expanding its market. NDPL identified slum areas as the biggest hindrance in securing new demand for electrical consumption (USAID 2006). It sought to collaborate with an NGO on a targeted outreach programme to raise awareness about the legal issues and risks surrounding illegal electrical use by the urban poor and slum dwellers, in order to secure their buy-in. This required a reputed and experienced NGO to enter the community and gain the respect of the slum dwellers.

This project emerged from the idea to supply safe and legal electrical connections for the welfare of poor urban communities. INDCARE Trust was approached by USAID and electrical utility company NDPL to establish an entry point into the community. It worked with NDPL to build upon its community-based research for the programme in cooperation with USAID in 2003. INDCARE Trust worked not only to legally connect slum dwellers, but also to empower them. It also sought to promote recognition of the idea that electricity was a right and not a luxury for all populations, including the slum dwellers. The organization played a crucial role undertaking community-based research, as well as educating slum dwellers of the benefits of legal connections and the risks associated with their illegal electricity connections.

INDCARE Trust was tasked with working in two slum communities—first the Bhalla Factory and later Jaipur Golden—to secure legal electricity connections (USAID 2006). It was perceived as having gained community insights through its pilot research, and hence could engage the community more effectively. It began by supporting NDPL's outreach and awareness raising efforts in these communities, specifically targeting woman, through the use of micro-credit and micro-finance tools (USAID 2006). Thereafter, it served to voice the interests of the community and negotiate demands on their behalf during the project, helping them overcome obstacles encountered during its implementation such as tenureship, financial affordability, and sustainability.

Ultimately, INDCARE was able to secure community buy-in by establishing trust, and through a relationship based on community empowerment and education. It conducted an awareness campaign that highlighted an electrical fire in the community that had resulted in the death of a child several years ago. This incident had remained in the minds of slum dwellers and resonated as a practical reason to secure legal electrical connections.

Project Description

The main objective of the project was to address the gap between the need and availability of electricity in two urban slums. To do so, INDCARE Trust sought to empower the community and aimed to address issues of legality and safety by initiating advocacy campaigns to raise awareness in the communities, impact behaviour and attitude changes towards illegal connections and electrical theft, and facilitate legal electrification by encouraging the community to voice its demands to relevant authorities.

The target beneficiaries were urban poor populations residing in two slum communities located in the north-west of Delhi. The project was initially implemented at the Bhalla Factory slum in Sultanpuri, named after a deserted factory in the area. Although manufacturing facilities were relocated in 1994, many workers had stayed on. Approximately 39% of households of the area earned less than a dollar a day. There was a notable lack of infrastructure. NDPL identified 694 houses as new consumers, although many were later found to be sub-divided into 2–3 homes, thereby putting a realistic estimate of the potential consumers to about 1,100. The project was replicated at the Jaipur Golden slum.

The project began when USAID contacted INDCARE Trust to promote legal electrification in the targeted Delhi slum communities. USAID's Energy Team began working with NDPL in 2003 to improve energy access. NDPL had identified slum areas as the biggest obstacle to reaching customers due to electrical theft. INDCARE Trust became involved as implementer of the project, undertaking activities that would encourage residents to opt for legal electricity connections in the two slums.

The project entailed a dual approach. Although, NDPL had envisioned an outreach campaign around the legal and safety issues of electricity use, INDCARE Trust persuaded them to be more proactive and subsidize legal connections as an alternative to theft. At the same time, it worked with the communities to communicate the safety risks of illegal connections and the benefits of a legal one. This resulted in forming a new relationship between the utility and the cluster residents, based on a shared recognition of the benefits of legal connections.

Key Players and Their Roles

Several key players were involved in the project at various stages, though the main role in facilitating connections was borne by INDCARE Trust. A grassroots organization, INDCARE Trust is a Delhi-based organization that used a self-help approach, namely, micro-credit interventions. It was responsible for the research that helped target the project, as well as its implementation in the slums. The organization seeks to raise the standard of living of the poor and the deprived. It operates as a CBO that specializes in working with women and addressing the needs of poor urban and rural populations through micro-finance.

NDPL, the electrical utility company, is one of the two privately operated electricity distribution companies in Delhi. It serves the north and north-west regions of the city. NDPL is a joint venture between the privately owned TATA Power and the government of India. It provided households in the Bhalla Factory slums of Sultanpuri with legal connections, thereby decreasing the influence of the local mafia, who supply users with electricity. It approached INDCARE, who had secured funds from USAID, to implement the project.

AED is an international non-governmental and non-profit organization that seeks to improve education, health, and social and economic development. It has a staff strength of over 3,000 globally, and leverages partnerships and innovative approaches such as social marketing. It was involved in the initial stages of the project to engage and educate the community on risks of electrical theft.

Several international organizations funded the project at different stages. The United States Agency for International Development (USAID) co-sponsored the project, and helped fund technical assistance and training. INDCARE collaborated with NDPL using financial support from USAID and expressed interest in cooperating with USAID. The organization works on various development components, including the role of energy as a crucial component for development.

The beneficiaries of the project were the slum dwellers who were recipients of legal electricity connections in the Jaipur Golden and Bhalla Factory slums.

Project Implementation

INDCARE had already initiated community-based research, supported by Department for International Development (DFID) and Gamos Pvt. Ltd, to understand the needs of the target beneficiaries. It had conducted surveys and workshops that explored the practical barriers facing access to electricity among low-income urban communities. Their research focussed on supply constraints, payment mechanisms, problems of non-payment or theft, community participation, and the quality of services provided. The data compiled from the demand and supply sides—through households and local utility surveys—highlighted the importance of innovative approaches to attract and sustain customers in low-income communities. Surveys were conducted by NGO partners among low-income communities in Delhi, the Philippines, and South Africa, which focussed on exploring the 'legality of land title combined with utility connection policy to restrict availability of legal supplies'.

INDCARE Trust's community-based research revealed that although connection costs were a barrier to access to electricity, the lack of available formal connections was a more important obstacle. In cases where households were entitled to metered electricity supplies, nearly all had connections. This also highlighted the fact that although slum households were often denied legal access for various reasons, these mostly related to the illegality of their settlements. Thus, extending the benefits of urban electrification to the poorest strata would require ways of catering to illegal settlements.

Regulatory and institutional arrangements

INDCARE and NDPL worked together to facilitate legal electrification by linking the slum dwellers. To meet the energy needs of the urban poor, agreements were negotiated between the utility company and the community by INDCARE Trust. For instance, INDCARE facilitated setting up a women's cooperative that would challenge and reduce the electricity rates offered by NDPL. INDCARE also trained self-help groups (SHGs) to negotiate their demands. The community was encouraged to challenge their electricity bills, which were initially overestimated. Through a series of organized trainings and meetings, community members and leaders learned to voice their concerns and demands to NDPL, and were able to negotiate in their interests. This was also crucial because INDCARE was able to successfully change the community's perception and encourage the people to be responsible customers and pay for what they used.

NDPL entrusted INDCARE with the responsibility of electricity distribution to the slums, but the onus was not taken up when project replication was being considered. INDCARE Trust's role was to raise awareness through an outreach and advocacy campaign. The objectives of the campaign was to affect attitude change toward safety and legal electrification, and provide micro-credit to enable as well as increase the affordability of these connections (Rojas and Lallement 2007). However, NDPL sought to change this scenario with the project replication.

INDCARE served as the intermediary intervener. It supported and offered micro-credit loans to women's groups to finance new electrical connections and pay for electric meters. This enabled slum dwellers to afford access to legal electricity connections, and supported their initiation of micro-level economic activities (Rojas and Lallement 2007).

INDCARE Trust was responsible for conducting community-based research, using innovative and participatory research tools. The project gathered demand data from households through surveys, and supply data from local utilities that had developed innovative approaches.

The organization also led the facilitation of legally connecting slum consumers with electrification through a dual approach—actively educating them of the safety risks of illegal connections and benefits of legal connections, while using micro-finance tools to subsidize the cost of a new connection. It helped organize education campaigns, discussions, and negotiations between NDPL and slum dwellers, serving as the project mediator.

A women's cooperative in the community was established to reduce the initially overestimated electricity rates, who, then questioned the first series of bills. With support from INDCARE, the community organized itself to convince the government as well as the service provider that it would be responsible and pay its electricity bills, following legal recognition.

Financial arrangements

USAID funds financed this project in terms of capacity building, but it was a micro-credit loan by INDCARE that helped ensure the success of the project by overcoming a financial obstacle in the community. Toward the end of the project, when consumers faced the unforeseen obstacle of an additional $ 100 to finance a cable to connect to the grid, USAID absorbed this cost upon the demand of the community. This is of note because clear financial responsibilities and costs were not accounted for in the beginning, and can pose significant hurdles to energy access when significant finances for poor communities are involved.

Innovative approaches

The education, engagement, and awareness-raising methods of INDCARE were creative and innovative. Capacity building, skill building, and training of local community formed the core of the project and gaining the trust of the community. The key educational and implementation role was played by INDCARE, who secured community buy-in and used information, education, and communication (IEC) materials and activities such as street theatre to positively impact mindsets, behaviour, and knowledge about the project.

For instance, INDCARE conducted a knowledge, attitude, and practices (KAP) study to assess the pre-intervention and scope of work. Using a tool called Mainstreaming of Urban Poor Women in Design for Resource Assessment (MUDRA), it targeted and finalized the suitable slum communities for micro-finance interventions. This was a crucial and innovative step because it assessed community aspirations, improved financial capacity by improving accessibility to financial institutions, and targeted the role of women.

Micro-finance institutions and tools were used to source the new electricity connections, refinance bills, and pay for the electricity meters upfront. Financial subsidies of the electricity connection costs were directly paid through micro-credit loans given to the households. USAID, INDCARE, and micro-finance institutions collectively, and at various stages, subsidized the connection costs over time. Ultimately, INDCARE was responsible for a micro-credit programme in the Bhalla Factory slum of New Delhi, which enabled slum dwellers to finance their own legal electricity connections.

The NGO's expertise and methodologies to target the communities were fairly innovative. For example, INDCARE used micro-finance tools that targeted women, who generally comprise the majority of urban poor population and are responsible household members. It also used several unique education and research tools including participatory learning and action (PLA), knowledge assessment and performance (KAP), and MUDRA (an INDCARE tool for urban research).

INDCARE's innovative and creative methods were employed to engage the community, raise awareness, and educate the community members of the benefits of legal electrification. The methods included street performances, workshops, media campaigns, discussions, and negotiations training.

Problems that arose and how they were overcome

One of the first obstacles was securing community buy-in and trust. INDCARE also wanted to teach the community the importance of investing and availing of these opportunities. The community members were taught how to communicate with government officials in a manner that would be mutually beneficial rather than resorting to protests, fights or negotiations. INDCARE, thus, helped systemize the process for the community to demand electricity meters from NDPL and the government. The community began to self organize and started demanding new connections. New customers—the women—became project facilitators. This proved immensely helpful in socially promoting and marketing the connections. Thus it was a continuous and sustainable chain reaction to secure the demand for new connections. The community was equally involved in co-educating and sharing information.

Having learned how to make their demands for legal recognition, the slum dwellers were offered a deal for recognition by NDPL to enable meters and electricity access. Another hurdle was financial in nature. USAID funds were earmarked for capacity building. However, there was a gap in affordability of these services for the community. Project facilitator INDCARE offered a time-bound micro-loan to the community on the condition that it would be paid back in time. The management of the loan was done by the head of the MMH, who were eventually responsible for its repayment. The Mahila or women's group served as a watch-group to follow up the negotiations with NDPL and install the meters.

Results and impacts

As a result of the project, meters were installed and paid for at every slum household of Bhalla Factory, as a result of which there were no more electrical thefts. The micro-loan was paid back in full and served to link two projects. INDCARE had used a self-help group and micro-loans for electricity as well as to increase and secure demand. This was a unique and innovative practice.

All the slum households in Jaipur Golden areas were also provided with legal electrical connections. INDCARE mediated between slum dwellers and NDPL, with all project costs being borne either by the community, INDCARE or USAID.

In the first few months of implementation, almost 50% (400 out of 850 households) in the slum had requested legal electricity connections (USAID 2006). Eventually, 100% connectivity was ensured, including a total of 481 connections at the Bhalla Factory slum.

INDCARE Trust's micro-credit financial interventions that prioritized women served to increase slum affordability and access to legal electricity services. It also enabled the launch of micro-level economic activities and strengthened financial capacity of the slum dwellers.

As many as 5,500 slum dwellers directly or indirectly benefitted from the project. The project empowered the community to procure basic infrastructure and also helped the slum dwellers set up a savings and credit system through micro-finance tools. By targeting women in the communities, the project was empowering as well.

INDCARE Trust was appointed as the franchisee organization of utility at the Bhalla Factory slum.

Enabling Environment and Barriers Faced

One key enabling factor for this type of project was the opportunity to expand the market to slum dwellers—an opportunity arising out of privatization of India's electrical services sector.

Another key enabler that helped overcome obstacles as they arose was the commitment, adaptability, and flexible nature of INDCARE Trust. For instance, to facilitate the electricity connections, the organization provided a micro-loan to the community to ensure that the demand for the connections was met.

INDCARE Trust was committed to securing community engagement and trust, which ultimately allowed NDPL access into the slums. As the implementer, it was also responsible for engaging community participants and support on a wider scale while targeting women in particular. This was a crucial approach that used a variety of participatory and awareness generating materials and activities to alter community behaviours, address stigma, and enhance knowledge about the project. The organization worked to establish and build relationships within the community, which was a major enabler of the project's success by helping to overcome barriers during project implementation.

Effective institutional arrangements were essential for the success of this project. Establishing a public-private partnership (PPP) between the community and the utility company, for instance, ensured that

they were more responsibly and fairly treated. INDCARE Trust played a key role in facilitating this type of a relationship.

The community-based research led by INDCARE Trust ensured the effective targeting and involvement of the community, as opposed to charitable approaches. This 'empowerment approach', or treating the slum dwellers as customers ultimately helped them help themselves by recognizing the inherent risks in illegal electrification and reaching the decision to pursue a legal electrical connection.

INDCARE Trust's micro-finance interventions enabled the slum dwellers to access legal electricity connections, while supporting themselves via economic activities. Additionally, the 'dual approach' was crucial to the success of the project. It pushed NDPL to play a more engaged and active role in their outreach campaigns, emphasizing legal and safety issues through community engagement while offering micro-loans to facilitate the legal connections as an alternative to electricity theft. To enable the consumer-service relationship between the utility provider and the slum residents, INDCARE worked to shift perceptions on both sides—by making NDPL recognize the slum residents as potential customers, as well as the marginalized community, who were used to being sidelined.

INDCARE Trust played a crucial role in changing the preconceived notions held both by the community and the utility company, through its concerted outreach and education efforts to raise awareness and convey the benefits of legal electricity connections. By counselling the populations and using a real example from the slums to emphasize the risks, INDCARE Trust was able to motivate slum dwellers to get properly wired and legal electricity connections to avoid future accidents.

Through its community-based research and engagement, INDCARE identified barriers to access to electricity amongst low-income urban communities understand the concerns to better. The concerns included constraints to electricity supplies (whether the principle constraints were economic); payment mechanisms (reasons behind non-payment or theft); participation (ways of involving the community in utility service provision); and quality of provision (problems encountered at present and priorities of customers).

One barrier to replication was the strong leading role played by INDCARE Trust. This project was not scaled up as a result of a falling out in the relationship between INDCARE and NDPL. The project was unable to continue without financial support, and it was felt that arranging for funds and expanding the electricity market was not a responsibility of the NGO. Funds from USAID were largely used for research and capacity building. The micro-credit loan given to the women and self-help groups enabling them to secure electricity connections came from INDCARE Trust. Continuity, replicability, and sustainability posed a challenge in this case.

The issue of land tenure was overcome to secure legal connections for these slum dwellers, who lived in unauthorized settlements. They were trained by INDCARE Trust using street performance methods to collectively make demands and negotiate their requirements with the government and NDPL.

An obstacle was lack of government recognition of the slum dwellers' homes and habitats. However, they got themselves organized and collectively demanded legal recognition of their colonies. The women began to conduct door-to-door surveys in unauthorized areas to convince NDPL of the demand,

communicate the benefits to these households, as well as demonstrate to the government the number of habitats that could be electrified if they would engage in some negotiations.

Key lessons, Continuity and Replicability

Anticipating financial responsibilities and delineating them beforehand is crucial to absorbing unanticipated costs without putting an additional burden on the urban poor. This project served as a link between the service provider and residents, and as a result had immediate on-the-ground impact. It also highlights the importance of community-based organizations to work with and engage community buy-in.

The case demonstrated the importance of empowering slum dwellers, as well as treating them as customers instead of as charitable cases. Targeting and empowering women was also a crucial lesson for sustainability of the programme because women as the heads of households are cornerstones of their society, who educate their families and communities.

Use of financial incentives and micro-finance tools was key to widespread benefits. INDCARE Trust used micro-finance tools to increase the affordability of access to legal and safe electric connection, as well as supporting them to initiate economic activity at the micro-level and thereby improve their overall financial capacity. Finally, it empowered the community by breaking vicious cycles of illegality/mafia control.

The case has several key lessons for continuity and replicability. The project began in the Bhalla Factory and was later replicated in another slum, Jaipur Golden. NDPL has shown commitment in collaborating with INDCARE Trust to target new communities while continuing their efforts in these two slums. However, although it was successful, the project will not be replicated in new areas, given the funding obstacles caused by lack of USAID support, no funds offered by NDPL, and the NDPL's disillusionment surrounding its new terms of contract.

The project changed perceptions, removed misconceptions, and forged relationships by addressing the stigma facing the slum dwellers, and enabling them to change their own situation. Not only did it change the community's perceptions of the service provider, but also vice versa. Ultimately, this resulted in slum dwellers being seen as responsible consumers.

Signing contracts and agreements amongst the stakeholders helped ensure project success. For instance, NDPL delegated responsibilities to INDCARE Trust to implement and monitor electricity distribution for the Bhalla Factory slum. Such partnerships can fill the gap between need and access, and supply and demand, by involving the various stakeholders and encouraging responsible consumers in slums. INDCARE recognized the need, challenges, and benefits of legal electrification of slums, and ultimately convinced the utility company to engage with the slum communities. However, in the end it was the same contract that limited the continuity, replicability, and sustainability of the project.

As a result of legal electrification, new consumer relationships were established between the utility company and slum households. The simple act of providing them with legal electricity connections helped transform disadvantaged and marginalized households into responsible consumers.

The replicability potential is ideal in terms of working with community-based organizations to target needs. It also serves as a model for other projects to follow. For example, the successes from the first slum led to a larger scale project being initiated in another slum in the same region.

However, in this case, the project's success hinged largely on the role of INDCARE Trust. The organization conducted research and arranged for a micro-loan to women in the community to promote energy access. Relying on a single organization is unsustainable in the long run. Furthermore, NDPL tried to get the organization sign contracts to facilitate its own expansion of an energy market, which resulted in non-renewal of their contract and collaboration to increase electrical access for slum dwellers.

Thus, although NDPL approached INDCARE to replicate the programme in 101 additional clusters, the organization refused to do so because of differing terms and conditions. NDPL offered no funds for capacity building, even under corporate social responsibility (CSR). Furthermore, INDCARE felt that NDPL wanted the organization to act as a loan shark—commissioning the NGO to secure its market by electrical demand in the slums. Finally, NDPL wanted INDCARE to be entirely responsible for the connections, including regulating anti-theft and looking after the electrical boards and the poles. INDCARE, as a non-profit organization and as an NGO, did not see it fit to take on this responsibility. Its role was seen to facilitate the negotiations and leverage their strengths. Continuity and replicability were thus prevented. Clearly delineated PPP and responsibilities are therefore key to leverage appropriate strengths and expertise.

This was a unique programme in that the micro-credit loan was given by the NGO INDCARE to the community through self-help groups and women's community organizations that monitored the loan, recognized the affordability, and eventually paid it back. INDCARE's flexibility, adaptability, and commitment to serving the needs of the community led to the success of the project.

The case raises the issue of financial access, affordability, and funding for such projects and the importance of clearly identifying from the beginning the stakeholders and the respective costs they will bear. In this case, financial and legal obstacles were overcome through a series of negotiations and via community empowerment, supported by INDCARE within the community.

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ANNEX 5 | NATURAL GAS DISTRIBUTION FOR LOW-INCOME FAMILIES IN THE CARIBBEAN COAST AND SOUTH-WEST REGIONS OF COLOMBIA

Snapshot

TITLE OF INITIATIVE	NATURAL GAS DISTRIBUTION FOR LOW-INCOME FAMILIES IN THE CARIBBEAN COAST AND SOUTH-WEST REGIONS OF COLOMBIA
Objective	To provide 35,000 of the poorest households along the Caribbean Coast and in the south-west regions of Colombia with natural gas service connections
Region	South America
Country	Colombia, Caribbean coast, and south-west region
Urban poor details	Over half of Colombia's population lives below the poverty line, despite the concerted government reforms between 2000 and 2004 (Mandri-Perrott and Patella 2007). It is estimated that 85% of natural gas users belong to households that are classified as among the lowest socio-economic groups. The Caribbean coast and south-west region contain some of Colombia's poorest households (World Bank 2008).
Duration	2006–2014
Key stakeholders	• The Global Partnership for Output-Based Aid (GPOBA) • Regional gas distribution companies (Guajira, Gases del Caribe, Surtigas and Gases de Occidente) operating under Promigas, Colombia's largest gas holding company • The charitable arm of Promigas, Fundación Promigas, implemented the project using expertise and funds from the GPOBA • Project beneficiaries were the poorest households, classified as strata 1 and 2 as per the Estratificación Socio-Económica (ESE)[33]
Current status	The project completed phase 1 of providing new gas stoves and installing connections in 2008. The regional gas distribution companies will continue to finance these connections over six years (2008–2014), while Fundación Promigas and an independent verification agent (IVA) will implement annual monitoring and site checks. The project aims to be replicated in several other countries.

Background

This project sought to subsidize the one-time connection cost for natural gas access, enabling long-term socio-economic benefits for low-income communities in Colombia. Despite ample natural gas resources, there is a lack of clean energy access amongst the poorest segments of Colombian society.

Poverty affects a large portion of Colombia's population. Gas rates are especially high in the Caribbean coast, where the average annual income approximates $ 168 (Mandri-Perrott and Patella 2007). Although the Colombian government implemented a subsidy scheme that connected 17 million poor

33 ESE stands for Estratificación Socioeconómica (or socio-economic stratification), which is a household targetting system used in Colombia to target social programmes.

families (40%) with clean energy, many still continue to use dangerous and inefficient fuels to produce energy.

Colombia has plenty of natural gas reserves, but poor households are frequently unable to access the fuel because of the steep service connection cost of approximately $ 370 (World Bank 2008). Due to the high cost, households end up utilizing polluting fuel like firewood, liquid petroleum gas (LPG), and coal for heating, cooking, and other activities. These fuels are inconvenient to procure, are not economically viable, and can be injurious to health in terms of emitting particles and pollutants that irritate one's eyes and lungs. Such usage has not only had environmental consequences, but also results in high healthcare costs. Natural gas connections, however, offer cleaner, more affordable fuel alternatives, and are more convenient than using LPG cylinders.

Since the 1990s, Colombia's government has targeted increased natural gas access among poor households. But, efforts have yet to successfully encourage clean energy access on a large scale (Mandri-Perrott 2010). It began a subsidy scheme where households received a reduction of 40–50% discount on the initial 20m³ of natural gas used (Mandri-Perrott 2010). However, many households still remain unable to afford the one-time connection fee required for obtaining natural gas service.

In 2006, Promigas approached GPOBA to finance a programme that would provide poor households with a natural gas connection. Thereafter, GPOBA worked with Promigas' charitable body Fundación Promigas and four regional distribution companies to implement the project.

A pilot initiative by the Dutch Directorate General for International Cooperation aimed to connect 10,000 new gas connections was carried out. The success of this project formed the basis for a bigger project by GPOBA.

In order to address the identified gap in clean-energy access for the poor, GPOBA designed a project to subsidize 38% of the new connection cost (approximately $ 141) using funds from a $ 5.1 million grant (World Bank 2008). The remainder of the total connection cost was divided amongst and financed by the four local gas distribution companies over six years. The beneficiary low-income households thus received a loan through regional gas distribution companies to cover the remaining amount ($ 229) to be repaid over six years. Once they subsidized the cost of a new connection, the remaining grant money was given to the regional gas companies to distribute loans over six years, thereby subsidizing the remainder of the cost.

This project was conceptualized by GPOBA in coordination with Fundación Promigas, the charitable arm of Promigas, the largest gas distribution and holding company in Colombia. The GPOBA first conducted a monthly household expenditure test. This helped to identify the poorest communities to target during the project, and determined that a direct subsidy of $ 141 could cover 38% of the total connection cost. The project was then implemented by Promigas' regional gas distribution companies: Guajira, Gases del Caribe, Surtigas, and Gases de Occidente. It targeted low-income households in the Caribbean coastal and south-west regions—areas with some of the highest rates of poverty in Colombia (World Bank 2008).

GPOBA used grant money from the World Bank and other donors to fund an output-aid- based project. Funds were used to directly subsidize the one-time, initial cost to connect Colombia's poorest

households to the natural gas grid. Having identified the chief barrier to clean and affordable energy access facing the poorest segments of society as being the cost of a new connection, the project aimed to implement new natural gas service connections and install stoves in 35,000 of the lowest-income households.

This project was conceptualized in an effort to fill the services-provision gap and increase access to clean energy. It aimed to bridge the gap between government subsidy schemes and consumer demand through innovative, output-based (micro) financing. Several stakeholders including auditors, grantees, and natural gas companies were involved in this project at different stages to ensure energy access. Grant money from the World Bank was channelled by GPOBA and Fundación Promigas, the two main implementers. The first phase of the project was formally implemented from June 2006 to November 2008.

Implementation was carried out by various partners. The four regional gas distribution companies provided the new connections and stoves after the municipalities had identified the lowest income households. The media was used to publicize the project, engage communities, and ensure that the right households were targeted. To verify the new connections and their use, financial company Deloitte and other independent verification bodies were involved. Once proof of payment of the first three months of bills was shown, the money was granted.

Project Description

The aim of the project was to install a gas connection and stove in each of the 35,000 households along the Caribbean coast and south-west regions of Colombia. It focussed on enabling access to natural gas by connecting poor Colombian households. This was achieved by partially subsidizing the cost for low-income consumers, that is, paying for 38% of the cost of a new gas connection and installing a stove.

The main objective behind this was to provide clean and inexpensive natural gas service connections and stoves to 35,000 of Colombia's poorest households. It used an output-based aid process, first providing the service connections, then verifying them over time via the paid bills, and subsequently allocating the grant money.

The project targeted beneficiary households from ESE Strata 1 and 2—the lowest income groups in Colombia—who are geographically concentrated along the Caribbean coast and in the south-west region.

The GPOBA used grant money from the World Bank and other donors to fund an output-aid-based project. Funds were used to directly subsidize the one-time, initial cost to connect Colombia's poorest households to the natural gas grid. The chief barrier to clean and affordable energy access facing the poorest segments of society was the cost of a new connection. The aim of the project was to implement new natural gas service connections and install gas stoves in 35,000 of the lowest-income households.

The GPOBA conducted a monthly household expenditure test to identify the poorest communities to target and determine the effectiveness of a direct subsidy of $ 141 that could cover 38% of the total connection cost. Essentially, the subsidy worked to fill a gap between the consumer and the supply side, in support of the new connection.

A small-scale pilot project was expanded upon and implemented from June 2006 to November 2008. Over 34,000 new natural gas connections were subsidized during this time. Financing the balance will continue on behalf of the regional natural gas companies over the next six years.

The project thus entailed two components. The first provided new natural gas connections among the identified households. The second was a management, monitoring, and evaluation of the use of these new connections. It was implemented and coordinated by Promigas, who subcontracted the implementation amongst four regional gas distribution companies.

Despite significant reserves of natural gas in Colombia, its poorest households are often unable to use the fuel because of the high service connection costs. There appear to be links between health, poverty, and access to clean and affordable energy. WHO reports that the smoke generated from burning biomass fuels indoors is a major health risk (GPOBA 2009). It estimates that 2.7% of diseases worldwide are caused as a result of this smoke, and in developing countries it is the third leading cause of death (GPOBA 2009). The impact is particularly severe on females and children, who are often in closest proximity to the polluting fumes.

Given a lack of income, these households are forced to use costlier and more polluting fuels because they cannot afford the start-up cost for new natural gas service connections. Extreme poverty exists in many households in the Caribbean coastal region and hinders their access to clean and cost-effective energy. Despite existing subsidy schemes provided by the government, the GPOBA and Promigas sought to fill the gap between the demand and supply of clean, affordable, and accessible energy for the poorest households.

Even then, the initial connection cost is a barrier to natural gas access for Colombia's poor. They continue to use other sources of costlier, riskier, and unreliable fuels. Electricity shortages plague areas with lack of infrastructure, firewood and coal are difficult to gather and use, and cause eye infections and allergies when burnt. This project, therefore, subsidized the initial cost of a stove and new connection from the consumer, and from the supplier side it ensured a long-term grant for sustainability of use.

Key Players and Their Roles

Player	Role
The beneficiaries	The target groups were identified as households from socioeconomic strata 1 and 2. The project enabled them to transform into healthier and more sustainable communities.
The Global Partnership on Output-Based Aid (GPOBA)	GPOBA, a World Bank-administered programme, coordinated and led the project. They were approached by Promigas, and in 2006 began this programme with Fundación Promigas to promote natural gas use among poor households.
Promigas	Colombia's largest gas holdings and transmission company, it identified and involved regional distribution companies for implementation of the project. Some of its regional distribution companies were entrusted with providing new gas stoves and connections. The provision of connections was divided amongst the following gas distribution companies: *Gases de la Guajura* (5,000 households), *Gases del Caribe* (10,000 households), *Surtigas* (10,000 households), and *Gases de Occidente* (10,000

Player	Role
	households).
Fundación Promigas	The charitable arm and foundation of Promigas, it was the main project implementer and coordinator, liaising between the households, gas companies, and the funder.
Municipal leaders and the media (local TV and radio stations)	These groups helped secure community buy-in and provided ESE information to target the beneficiaries.
Fundación Amigos	One of several local NGOs and CBOs that helped with the outreach and to secure community buy-in. Fundación Promigas worked with different collaborators/partners depending on the region. In Baranquilla, for instance, a region infamous for its drug cartels, the programme implementers had to gain the trust of the community before gaining access to them.
Media organizations	A strong media and outreach component, which used TV/radio to raise awareness and involved women's groups to secure community buy-in.
Deloitte and other independent verification agents (IVA)	These were asked to certify and inspect the new gas connections as outputs. Their technical and financial audits formed a monitoring and evaluation component that was incorporated into the project's overall design.

Project Implementation

The project was implemented in two phases. Phase 1 dealt with providing the initial connections, while phase two comprised the longer-term subsidy and monitoring and evaluation aspects. Local municipalities helped to initially identify eligible recipient households from strata 1 and 2. Fundación Promigas then worked with regional distribution companies to install the new stoves and connections. Once these were in place and following the commencement of the gas service, the regional companies documented the outputs, namely, the new connection, to ensure quality standards were met and proof of services via payment of three bills. Fundación Promigas then hired IVAs to review the gas connections as well as to perform technical and financial audits at random, thereby ensuring that all criteria were met. The GPOBA disbursed funds, after reviewing the verification of the outputs by IVA and Fundación Promigas. The regional distributors were therefore compensated for the new service connections. The initiative thus included a subsidy that worked as a one-time connection cost from the demand side and a loan through the gas company from the supply side.

Regulatory and institutional arrangements

The GPOBA granted the money to finance the subsidy, and provided project overseeing to ensure that the poor could maximize the benefits of each dollar, using output-based aid mechanisms.

The partnership between GPOBA and Fundación Promigas used an output-based approach, whereby funding/subsidy was contingent on the following criteria: proof that the household is strata 1 or 2, in other words, belongs to the poorest populations; certification and connection of the new gas stove and service by an IVA; and proof that the households with a new gas connection have obtained and paid for their service for at least three months (Mandri-Perrott 2010).

Fundación Promigas co-implemented the project with the regional distribution companies using GPOBA-coordinated grant money. These companies provided the resources, financing, and technical know-how

for the new connections. Fundación Promigas oversaw the work and ensured that the new connections were installed properly.

Financial arrangements

GPOBA grants operate on an output basis. Funds are deployed when the grant recipient—Promigas and the regional gas distribution companies, in this case—can show that the measured outputs were achieved. Thus, the disbursement of grant money relies on the delivery and documentation of outputs.

The GPOBA program is administered by the World Bank. The project in Colombia received donor support from Department for International Development (DFID) and International Finance Corporation (IFC). The funds for the program were granted by the GPOBA only after measured outputs had been achieved.

Promigas coordinated the allocation of grant funds amongst the four regional distribution companies, or implementers. It was also the body held accountable for consolidating and processing payment requests to GPOBA. These were based on: 1) a stratification certificate, 2) a technical certificate, and 3) a connection certificate from the household.

The IVA managed the technical and financial audits to evaluate the project and played the role of a monitor. But the project lacked capacity building, skill building, and training of the local community to maintain the connections, understand when leaks occur, and prevent misuse while promoting energy conservation. Skills and technical support came from the local distribution companies, although perhaps an independent nodal person could be identified in every region to help train and maintain connectivity over time.

Innovative approaches

A defining element of the project was the GPOBA mechanism, the basis of output-based aid. Instead of providing the connections and stoves for free, and subsidizing them 100%, the partial subsidy of 38% enabled a wider reach of the project to 35,000 households, instead of, say, 10,000 households. Customers, therefore, had a responsibility and felt a sense of ownership when paying their bills and being included as part of the system. The natural gas connection has essentially facilitated a transformation into sustainable and healthier communities.

This differs from traditional investments and microfinance endeavors or micro-loans, where the impact is measured in terms of inputs rather than direct output. Output-based aid lets donors allocate resources and funds more effectively by estimating the costs per beneficiary. It has inbuilt checks-and-balances mechanism. As a result, more resources can be leveraged and allocated effectively to help more people. 'The GPOBA process allows the measurement of the progress of the project and shows how outputs need to be documented and presented (GPOBA 2009)'.

Output-based aid is an innovative way of granting and targeting donor funds for development aid. The subsidies were granted once the outputs were confirmed. In this case, the measurable outputs were the gas connection and stove. An independent verification agent had to confirm the existing gas connection with proof (showing three months of gas bills had been paid). Thereafter, GPOBA allowed the payments.

This was evidence of a customer and service provider relationship, but it needs to go beyond three months. Perhaps, once a year for the next six years until the loan has been paid off can be considered an option.

Level of involvement of the stakeholders, especially the beneficiary community

The success of this project resulted from the collaboration and division of responsibility among the different stakeholders:

The beneficiaries of the project were the recipients of new, subsidized natural gas connections and stoves. Eligible participants were identified by local municipalities as the poorest households—classified as strata 1 and 2 according to the ESE ratings by Colombia's National Planning Department. Their role was to show evidence of their new connections so that the grant money could be transferred to subsidize their new gas connections. The payment of bills on time was part of the inbuilt monitoring, contingent on the disbursal of funds.

Municipal leaders helped identify households from strata 1 and 2 and publicized the benefits of these new natural gas connections for healthier, more sustainable communities. The media played an outreach role, coordinating the buy-in of communities by engaging them and publicizing the project to effectively target the beneficiaries.

The GPOBA conceptualized and provided project expertise by devising the output-based aid guidelines. It provided and coordinated financing of the subsidy to ensure maximum utility of all the funds granted to assist the poor. It also helped identify partners, document the results, and dispense the allocated funds once outputs were verified. Its main role was providing expertise for the output-based aid, whereby funds were deployed to the grant recipient (Promigas and the regional distribution companies), once measurable outputs had been achieved.

The World Bank, via the GPOBA, was the main financier of the project, extending funds to the tune of $ 5.1 million. Donor support for the project also came from the International Finance Corporation (IFC) and the Department for International Development (DFID).

Fundación Promigas, the charitable arm of Promigas, served as the main implementing partner. It was responsible for coordinating, identifying, and supplying the new natural gas service connections. It was responsible for overseeing the work and ensuring that the new connections were established properly.

Promigas leveraged its network of regional gas distribution companies in Colombia, and was responsible for implementing the project. It divided the new connections amongst the following regional gas distribution companies: Guajira, Gases del Caribe, Surtigas, and Gases de Occidente, and collaborated with service providers at various stages of the project. The regional companies provided the requisite resources, household funding, and technical expertise to install the new stoves and gas.

Deloitte and another independent verification agent (IVA) formed two private financial auditor firms were hired to measure the output by verifying the new connections and payment of three months of electricity bills. As independent verifiers, they played an unbiased, project monitoring role.

The beneficiary households were approached with gas connections, but were tasked with maintaining the consumer-service relationship. They were explained how it would work, and that, thereafter, gas meter would be checked and a monthly bill sent at the beginning of each month.

Household buy-in was secured by explaining the project and demonstrating the impact of this subsidy on their energy expenditure: The evidence that natural gas was a cheaper and cleaner fuel than LPG, firewood or coal ($ 12–20 a day) helped secure buy-in, while the project created a sense of community ownership because it was a partial subsidy instead of the new stoves/connections being provided for free.

From its inception, the project identified and anticipated certain risk factors and tried to address them through the project design. One concern identified by the project's architect was ensuring and maintaining a demand for natural gas by the consumers in these low-income households. To address this issue, the households were subsidized on the initial service connection cost and were asked to pay an initial amount that was equivalent to their monthly energy access charge. There were no incentives to encourage regulation, fuel conservation or supportive education program for the beneficiary households. This was because initially, the consumers had to be encouraged to actually use their connections consistently, instead of not doing so. As such, conservation concerns never arose.

Another practical obstacle encountered was that the grant money was in US dollars and had to be converted in order to subsidize costs in Colombia (Mandri-Perrott and Patella 2007). Currency devaluation became an issue for the project, affecting the subsidy and budgeting estimates. In this case, the cost was absorbed by the World Bank as a charitable practice. For the future and for other program, a system to protect against such a risk is required. Explicit agreements outlining responsibilities were identified as a way out (Mandri-Perrott and Patella 2007).

Ensuring community involvement was closely linked to the demand-side risk and questions of whether consumers would use the sustainable fuel system enabled through the project. This issue was mitigated through the pilot and study, and similar outreach involving poor communities by engaging the media, community leaders, and representatives.

Verification of connections and energy use was another concern raised during the project. The project relied on a series of checks and balances using verifications from independent authorities. The disbursement of grant funds was contingent on providing this evidence. Although paid gas bills were verified up to three months, there was no payment check-ins thereafter. While the project used evidence of paid gas bills as a measurable output, it did not address concerns like misuse of energy, higher bills, energy conservation, and sustainability of use or longer-term risks. The most informal households—the poorest of the poor, who may not even have the infrastructure to live in—may have been overlooked by the targeting mechanism for not even having the habitats or separate kitchens for stoves (Mandri-Perrott and Patella 2007).

Results and Impacts

The project has had a positive impact on individual/community health and environmental conservation, and has proved to be economically sound at the same time, by providing an affordable fuel alternative and thereby resulting in decreased expenditure on health care.

The major impact has been in terms of healthcare savings. This implies that even greater savings could occur if the government supports the implementation of such a project on a nationwide scale. The households experienced a decline in the number of respiratory diseases, resulting in better health overall and a decrease in household health expenditure: 'For each dollar donated by the GPOBA, the government also saves approximately $1–2 over two years in the treatment of respiratory infections amongst adults and children' (GPOBA 2009). The switch from risky and polluting fuels to natural gas has enabled savings of half a month's income per year (Mandri-Perrott and Patella 2007). It also resulted in the reduction of health risks, and contributed toward significant savings from health expenditure associated with other indoor fuels (Mandri-Perrott and Patella 2007).

The project has had an extremely high success rate. Of the 35,000 new service connections that were targeted, 34,138 new connections were verified (Mandri-Perrott 2010). This was accomplished by proving 'satisfactory service delivery', measured by providing paid electricity bills for the first three months. Only 207 customers (2% of the total number of beneficiaries) were unable to continue paying for the service or verify their connections via the IVA (GPOBA 2009).

However, apart from the verification of payment for three months' worth of electricity bills, there is no way of knowing the impact on these households and their responsibility towards this form of energy. Health economics projections showed significant savings and benefits to the wellbeing of the households. But the project does not seem able to document energy conservation efforts or misuse, for instance.

This project was successfully completed—98% of the total connections were accomplished, and 34,139 connections were verified for three months' service delivery and payment of bills. Overall, the households and wider community benefitted from access to economical, clean, and more sustainable energy. The attrition rate was reported to be 0.01%.

By offering a gas consumption subsidy, the project enabled people use of a clean and affordable form of energy, which would have been difficult for them to access otherwise. Natural gas is a beneficial fuel because apart from being abundantly available and affordable, it is convenient to access, there is no risk of the user getting burnt, and is a cleaner indoor fuel. Firewood, on the other hand, has to be bought (alternatively, is time-consuming to gather), can cause burning, stings the eyes, leads to infections, and poses a serious respiratory health risk.

A study by the Health Economists Group from University of Cartagena and the Universidad del Norte showed almost 60% reduction in respiratory- and air-pollution-related illnesses (Mandri-Perrott and Patella 2007). Over a period of 10 years, they estimated major savings on individual and environmental health.

The research also demonstrated that 40% of households suffered from respiratory illnesses before the project (Mandri-Perrott and Patella 2007). After installing the new stoves, such illness fell by 75% due to decreased exposure to indoor air pollutants from the burning of fuels. The project revealed improved health outcomes, and was more effective both in terms of costs and outcomes than other directly targeted health interventions (Mandri-Perrott and Patella 2007). The study also estimated an economic rate of return of 62% over 10 years (Mandri-Perrott and Patella 2007).

Moreover, as a direct result of using natural gas to replace firewood, an estimated 34 hectares of forest and swamp land were preserved (Mandri-Perrott and Patella 2007).

The response of these poor households receiving access to energy has been positive. The project verified the demand and use of the connection by making proof of payment of electricity bills for the first three months mandatory. Thereafter, these bills serve to document the loan received through the gas company, which will continue over the six years of the project's duration. The project promoted 'responsible customers', who pay their bills on time and recognize the value of the new connections. They were even willing to sacrifice in other areas of their lives so as to ensure timely and consistent payments. It has also created a sense of ownership and helped the neediest of communities, who often feel neglected and whose issues remain unaddressed. The project has essentially helped them help themselves via a partial subsidy (Mandri-Perrott 2007; Mandri-Perrott 2010).

An inherent aspect of using natural gas has also been the promotion of an environmentally sustainable type of energy. Responsibility to address one's own health and well-being as well as that of the household/family and the costs involved were also addressed.

Enabling Environment and Barriers

An important enabling factor for clean energy access to poor households has been the large natural gas reserves that exist in Colombia. Although people were unable to afford the connection fees, they could pay their monthly gas service bills. As such, the situation was suited for an output-based subsidy project.

Another enabling factor was the reach of Promigas and expertise of the different collaborators. Having identified a gap in subsidizing clean energy connections, Promigas contacted GPOBA for guidance. Thereafter, the series of good checks-and-balances with expert partners—Deloitte (the IVA), GPOBA, Promigas, and Fundación Promigas—also facilitated the project by creating enabling conditions. Promigas' sub-companies benefitted by procuring new consumers and provided energy that was economically and environmentally sustainable in the long term. This consumer-producer link was facilitated in an innovative, output-based way.

In this case, an important enabling factor for the initiation, implementation, and ultimate success of this project was using the output-based mechanism from GPOBA. Output-based aid is effective because it minimizes waste of finances, increases efficiency, and ensures quality of standards through stringent oversight. This was especially applicable in this particular case, where a high connection fee acted as an impediment to clean energy access. It appears that such projects are best for supplying basic services and infrastructure (Mandri-Perrott and Patella 2007).

Key Lessons, Continuity, and Replicability

The project appears to be sustainable in terms of its impact. The households that received new gas connections are now using a cleaner, more sustainable form of energy. Although the first phase of granting new stoves and connections has ended, but over the next six years (2008–2014), Fundación Promigas will continue to grant annual certifications and employ the IVA for random site visits.

In spite of being a one-time cost of the connection, in order to ensure continuity, the funds are dispensed only when output is shown. Gas companies continue to subsidize beneficiaries for a period of six years, thereby ensuring supply. The verification of demand after the first three months is an indicator, but does not ensure demand. Further monitoring and evaluation after a period could be useful.

The experience of output-based aid to subsidize the provision of basic services in Colombia demonstrates efficient and effective use of funds. Clear project guidelines were set to target and implement new gas connections for the poorest households, and all payments of aid were delayed until measurable outputs were shown. This evidence-based decision making is being looked at while further promoting such projects. Replication, however, relies on several factors.

A key element of success was having good implementing partners, who were able to ensure the achievement of the project. The regional distribution companies had the technical expertise and scope to implement the project. There were also several inbuilt project design elements, which enabled project success such as the output-based aid mechanism, independent verification and certifications, and so on. The output-based aid mechanism was suited to the provision of basic services, and the independent verification agents were extremely effective in evidence-based resource allocation.

Working in collaboration with partners and implementers meant rapid installation of connections, while a partial subsidy allowed a greater number of households to be impacted. The project resulted in an overall improvement in the standard of living by addressing health issues.

Replicating this project depends on the availability of natural gas reserves or a similarly abundantly available economical and clean source of energy. There were several inadvertent benefits, including the impact being more dramatic in terms of health rather than the economics of clean energy access. This could perhaps be a method of engagement for these beneficiary communities and an improved way of targeting them.

Validation of the households was an unexpected benefit (Mandri-Perrott and Patella 2007). Many households were located in areas beyond the realms of city planning. As a result of billing and connection activities, the distribution companies undertook a survey to inform the municipalities of the new households and ensure their registration. Future projects could perhaps offer additional incentives for implementers as well as documenters to undertake supporting activities (Mandri-Perrott 2010).

The project successfully identified, targeted, and addressed a gap in clean energy use and access, and could potentially be scaled up in Colombia with clear targeting and liaising amongst collaborators and coordinators. A national replication is in the works to promote energy access for all.

Similar output-based aid projects in telecommunications and the water sector have experienced different degrees of success. In countries such as Cambodia and Armenia, project implementers have not been ready to take on the huge role in the manner in which Promigas did. This has been a challenge to replication elsewhere. Within Colombia itself, however, there is a lot of scope to scale up and ensure clean energy access for the country's poor.

The targeted energy access and subsidy could perhaps be scaled up in other parts of Colombia with improvements. The government could expand the project nationally with substantive healthcare savings for poorer households. This type of project is particularly efficient and effective in implementing the provision of basic goods and services to low-income populations. The successful replication of the project internationally will depend on the availability of natural gas or a similarly clean and economic energy reserve in the respective areas. Successful replication also depends on setting the specific targets and mitigating risks early on, and conducting pilot projects to check the feasibility and benefits over time. This case demonstrates the importance of identifying and collaborating with effective implementation partners.

Project management played a key role in the success of this project. Although owned by Promigas, Fundación served as a third party. Each company acted independently in terms of verifications as well. An important monitoring and evaluation (M&E) component operated in this way, while the GPOBA was also independently verifying the outputs. Fundación also administered the project and served as a link between GPOBA and the regional gas distribution companies. It helped the companies select the beneficiaries, ensured targeting goals were achieved, and helped coordinate agreements on the implementation and practical operations of the new gas connections. Fundación Promigas also regularly carried out field visits to clarify issues with the distribution companies in relation to the beneficiary households or with regards to payment mechanisms. This demonstrates, however, the need for a more active project manager who can work full time and interface with the different implementers (Mandri-Perrott 2010).

Cross verification of results and measurement of economic, health, and environmental impacts was also important. The IVA played a crucial role in verifying project outputs and activities to ensure the objectives were being met. The financial IVA (Deloitte) was already the financial auditor for the gas distribution companies, which helped save the cost of hiring someone new or unfamiliar with the ongoing activities. The benefit of an entirely new entity would be to critically evaluate the results in terms of health and the environment as well as the technical and financial audits (Mandri-Perrott 2010). Connections were verified at the end of each year, but also every month as part of the loan program. The bill was not only a receipt showing gas consumption, but was also proof of their loan payment and interest. Verification each month via close commercial relation was an innovative step.

A system needs to be in place as a protection from exchange rate fluctuations during funding. One solution is to outline the specific responsibilities from the outset. During the project period, the dollar depreciated against the Colombian peso. Hence, the actual payable subsidy was reduced and the difference had to be paid by the World Bank. There needs to be a mechanism whereby the financial burden would not be imposed on the implementers (Mandri-Perrott 2010). Thus, to address the exchange-rate risk, it is crucial to be explicit about who bears the burden of the risk. There are potential losses, but also the potential for benefits.

The project used an ESE classification system, which may not be up to date. The method of targeting beneficiary populations could therefore be improved. Furthermore, once they are able to access basic services, it is unclear whether the households need to be classified. The project could have just focused on strata 1 instead of strata 2 as well—the poorest of the poor (Mandri-Perrott 2010). For the purposes of addressing the needs of the poorest, one might reconsider the targeting methods, and whether another system could be developed such an eligibility/application scheme for low-income households.

Another method would be to use health data showing incidence of respiratory diseases, and to use that to target the beneficiaries (Mandri-Perrott 2010). Exclusion of target households based on technical considerations was a risk encountered during the project. Because of space restrictions of using natural gas, there needs to be a parallel program that can first ensure the site is safe for a natural gas connection; and if it is not, offer expertise and support to transform the site. A requisite of a natural gas connection is a separate kitchen space for safety, which could be a barrier if there are space issues. A parallel training and education program could help create safer cooking spaces among the poor households (GPOBA 2009).

Households that relied on LPG received a $ 20 voucher towards the connection cost as a financial incentive (Mandri-Perrott and Patella 2007). This was a means of encouraging them to switch from using the cylinder to having a natural gas connection set up. A comprehensive education component to explain the benefits of switching might also have been useful.

The involvement and interest of the beneficiaries via their subsidized connections are important for further engagement. The beneficiaries and implementing agencies organized a local media campaign and a series of outreach efforts to gain attention and gather support. The project involved the mayors of municipalities, leaders, and other community representatives to affect buy-in and community ownership of the projects. This also could be used as part of the component to provide information on the benefits/importance of clean energy.

Strong M&E components were an important feature incorporated into the project and were crucial for its success. The bill for consumers documented the customer loan program, operating through the distribution companies. The bill itself, therefore, not only documented gas but also the loan programs themselves. Fundación Promigas also ensured the installation of connections and verified these every year, but the bill was checked every month.

There was an education campaign that drew attention to the benefits of switching from LPG and replacing the cylinders. The households needed to be convinced over time. The issue of over consumption, misuse or conservation never really arose because these are poor households who did not waste in the first place. Given that initial usage was little, there was no need to emphasize a decrease in consumption. In fact, implementers from the companies and Fundación Promigas had to encourage consumption and convince the households that more is better.

The education module, which was led by Promigas, emphasized how natural gas was better than solid fuels and safer at the same time. LPG cylinder was an important example to show the cost differential and validate the benefits of a connection as against a cylinder. Efforts were also focused on depicting health impacts and on encouraging consumption.

An outreach component that would further engage as well as inform the beneficiaries is crucial to promote clean energy use and conservation. The project could benefit from strengthening the involvement and knowledge aspects, educating the households on matters related to maintaining the connections, ensuring a better understanding of the benefits, implications and impacts of using natural gas as opposed to other fuels, rather than simply providing the evidence of financial savings and the benefits of convenience.

The first phase of the project has been completed, and the outputs have been measured. As many as 34,138 new connections have been verified (98% of the expected total of 35,000). Financing by the gas companies will continue till 2014, led by the regional gas distribution companies. During this time, GPOBA will continue to respond to requests to disburse funds.

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ANNEX 6 | COMMERCIALIZATION OF IMPROVED COOK STOVES (ICS) FOR REDUCED INDOOR AIR POLLUTION IN URBAN SLUMS OF NORTH-WEST BANGLADESH

Snapshot

TITLE OF INITIATIVE	COMMERCIALIZATION OF IMPROVED COOK STOVES (ICS) FOR REDUCED INDOOR AIR POLLUTION IN URBAN SLUMS OF NORTH-WEST BANGLADESH
Objective	To reduce the exposure to indoor air pollution (IAP) through changes in behaviour and energy-use practices.
Region	South Asia
Country: city, state	Bangladesh: Saidpur and Parbatipur in the north-west region.
Urban poor	Saidpur and Parbatipur represent typical urban slums with cramped huts that have poor ventilation within or among them. On dry days, cooking mostly takes place in the scarce common space available outside, making it smoky and polluted.
Duration	2005–07
Key stakeholders	• Slum dwellers of selected wards in Saidpur and Parbatipur were the principal beneficiaries of the project • Winrock International, an American non-government organization (NGO) got USAID funding in association with Village Education Resource Centre (VERC) and Concern Worldwide Bangladesh, two Bangladeshi NGOs, in implementing this project. Appropriate Rural Technology Institute (ARTI) of India provided some technical support through Winrock • Local health volunteers, community leaders, local government officials and health workers, local artists and performers were involved at various stages of the project • Traditional cook stove makers and new entrants in the business were trained to manufacture the improved cook stoves. Participation of manufacturer of the stove parts and retail sellers of the components of the stoves was important for its success.
Current status	The project was completed in 2007, but selling improved cook stoves (ICS) has continued on a commercial basis. VERC continues to address queries and offer advice regarding ICS, and manages the micro-credit fund for entrepreneurs to provide new loans. It is expanding the project in the region and replicating a similar model in another part of the country. Concern has expanded its health programme in the northwest of Bangladesh.

Background

Ever since the independence of Bangladesh in 1971, the country's reliance on biomass for cooking has been a major concern. The Bangladesh Council of Scientific and Industrial Research (BCSIR) started its improved cook stove (ICS) and biogas projects in the early 1970s. The focus of this initiative was to increase energy efficiency and save the environment. At the time, an estimated 99% of the population used biomass for cooking.

In the early 1990s, along with energy efficiency, the focus on ICS also started considering indoor air pollution and its health impact on women and children. Several studies have shown the adverse effects on health that include headache, eye soreness, respiratory problems, asthma, pneumonia, blood pressure, and other diseases that result from indoor air pollution. An estimated 90% population in Bangladesh uses biomass for cooking. Although many carry out indoor cooking throughout the year, the

problem is more acute during the long rainy season when women are forced to cook indoors. Generally, the entire population is somewhat exposed to the smoke and fumes from the burning of solid fuel, but the most vulnerable groups are women and children. In a recent seminar held in Dhaka on IAP, the World Health Organization (WHO) reported 46,000 deaths annually in Bangladesh due to IAP. As many as 32,000 of the affected are children. IAP from burning wood, animal dung and other solid bio-fuels is a major cause of acute respiratory infections (ARI). WHO also reported that approximately 4% of all diseases in Bangladesh can be attributed to IAP (Asaduzzaman, Barnes, and Khandker 2010).

In Bangladesh, over 90% of households use biomass such as cow dung, leaves, twigs, straw, jute sticks, bamboo, wood, and so on for cooking purposes. Lack of proper ventilation in kitchens and congested household crammed in slum areas lead to heavy concentration of smoke and fume particles, especially indoors. The level of particles inside a kitchen where solid bio-fuel is used can be 30–35 times more than the prescribed WHO standard. Release of toxic substances like carbon monoxide and formaldehyde may also cause serious health problems. Women and children belonging to low-income groups are predominantly in danger of acute health problem, as they spend most of their time indoors.

To address the heath and energy issues in low-income households, the United States Agency for International Development (USAID) contacted Winrock International to design a pilot project in Bangladesh. The project sought to reduce the effect of IAP by improving both health/energy-related behaviour and by introducing improved cook stoves. To sustain the effort, the marketing of cook stoves had to be commercially viable. The project was built around generating social awareness on the adverse effect of IAP, micro-financing, and community integration.

Winrock partnered with Concern Worldwide Bangladesh and VERC, two NGOs working in Bangladesh. Both these NGOs have extensive experience in social, health, sanitation, education, and other issues in Bangladesh. The project commenced in 2005 and ended two years later.

The slums in Saidpur (population: 110,000) and Parbatipur (population: 26,000) were selected for the project. These slums are mainly inhabited by Urdu-speaking refugees who got stranded after the 1971 Independence war. Majority of these individuals used to work in the railway system. One of the project partners already had a health-related awareness programme running in the areas. This played a key role in the area selection process.

Accessibility to energy in rural and peri-urban Bangladesh depends on many factors, namely, availability, pricing, income, personal preference, interest of the family head, and other parameters. All forms of biomass that can be gathered freely, mainly by women and children, are widely used. Leaves, twigs and branches, waste papers, cow dung, jute stick, and straws are the preferred fuel used for cooking by the poor. Families with higher collective income use firewood and kerosene.

As much as 39% of households uses crop residue or some kind of agricultural waste indicating shortage of fuel wood (Asaduzzaman, Barnes, and Khandker 2010). In many parts of Bangladesh, the local biomass supply is inadequate. Hence, extremely poor families are occasionally forced to burn plastic and rubber materials for cooking purposes, which exposes them to even more dangerous and toxic fume. Despite knowing the adverse effect of burning biomass, they are helpless.

The average cooking time is about six hours a day, and the time spent to collect fuel by the poor is about 200 hours per year (Asaduzzaman, Barnes, and Khandker 2010). The opportunity cost for both these activities are high. The lowest income group in Bangladesh uses 15% of its annual income ($ 45) on energy (Asaduzzaman, Barnes, and Khandker 2010). The richer populations spend over double that amount, but their household income is four times higher.

Availability, income, and price play the most vital role in determining energy choice. Despite increasing awareness on health problem, the poor have no other option but to use biomass. This situation will not change without improving the overall state of the economy. The traditional single pot, clay cook stoves (fixed or portable) used by most are also cheaper and easy to build. They have only 13% thermal efficiency, and wastes a lot of fuel, while emitting more toxins and particles as a result of inefficient burning. The best way to improve the situation appeared to be by affecting behavioural change and undertaking low-cost technological intervention.

In 2003, USAID realized that most of the early donor-supported fuel efficiency programmes in developing countries focussed on stopping deforestation. The health benefits of using ICS were not being emphasized. As a result, the technology-driven interventions were not being sustained. Based on these findings, USAID appointed Winrock to develop a replicable and scaleable indoor air pollution reduction model based on behavioural change, market access, and health impacts using improved technology.

Winrock worked with two local NGOs in 2005 to implement the model. VERC was mainly responsible for identifying and disseminating improved cook stoves using a methodology of participatory assessment (MPA) tool. They were also responsible for training the local cook stove manufacturing entrepreneurs and managing the micro-credit programme offered to them. Concern Worldwide Bangladesh was already conducting a USAID-funded women and children's health project in the target region. They took the responsibility of raising awareness of IAP's adverse effect on health, and promoting behavioural changes regarding health and kitchen hygiene practices.

Project Description

The ICS project in Bangladesh was introduced in 1974. But efforts to promote ICS technology without simultaneous motivation and behavioural change were not successful. Even free distribution of ICS did not succeed in changing the old cooking habits.

Mitigating indoor air pollution by introducing ICS technology is a low-cost viable solution for a country like Bangladesh where fuel options are limited and household income is low. Reducing the harmful emissions through efficient burning of biomass not only improves health, but also reduces fuel cost. As a result, women and children have to spend less time in cooking and collecting fuel. It also increases the productivity of women and allows them more leisure time with their children. Early efforts to introduce ICS did not integrate the behavioural adjustment of the users and profitable social marketing of the cook stoves. This project also sought to overcome these initial limitations.

The main objective of this programme was, therefore, to develop a scheme to alleviate the effect of IAP on the health of peri-urban households through introduction of ICS, and simultaneously bring about a change in the behaviour of the inhabitants. The goal was also to create an enabling environment for the

social marketing of cook stoves as a commercially viable business. The programme sought to promote ICS by commercializing and increasing ICS availability to reduce the effect of IAP on human health and also bring down fuel consumption. The business model to market the stoves was based on commercial considerations to ensure sustainability.

The principal beneficiaries of the project were low-income peri-urban populations living in congested slums, especially those who were experiencing fuel scarcity. Among these populations, women with children aged eight and below received maximum relief from the change in the unhealthy environment of their households. Traders, technicians, and suppliers of ICS and its components also benefitted from the increased trade, training, and support from the project. General members and leaders of the community, health and social workers, the municipality government—all of them realized the benefit of a well-intentioned and well-planned project that boosted their confidence in their own ability. Both VERC and Concern learned many new methods and social techniques that they applied in their subsequent work.

The energy intervention programme comprised four core elements: local organizations, awareness development and behaviour change, market creation, and technology selection.

The local organizational structure involved developing champions, who realized the importance of the core issue of IAP adversity on health, and the opportunity ICS offers to solve the problem. These are the people who would maintain the sustainability of the intervention beyond the life of the project. Formation of community management committees (CMC) from the stakeholders, involving ward health committee (WHC) of the municipality and selling the idea to local leaders who would continue ownership of the project for long term were the challenges of this component of the project.

Tradition plays a big role in the social behaviour and habits of all in a society. This is all the more true for the uneducated and disadvantaged segments of the society. Many slum dwellers did not understand the extent of damage to their health by IAP, despite the obvious discomfort they felt in a smoky room. It was important to raise their awareness and increase their understanding of the ill-effects of IAP, and the opportunity to get rid of them by using ICS. The team had to design different kinds of messages using various media for the local people to understand the issues in their own language and culture, which was crucial for a lasting effect. Drama, film shows, printed leaflets, billboards, and so on were utilized to send the messages across.

Without importing foreign technology to make the ICSs, adapting to local technical support and supply had to be considered for a sustainable growth. Traditional clay stove makers were easier to train and motivate. At the same time, existing manufacturers of cook stove components were integrated into the project to produce the new components for ICS. One barrier to participation was financing for the changes. Micro-credit, used widely in other sectors, was offered to the entrepreneurs to overcome the financial barrier.

Technology needed to adapt to local biomass demand-supply realities. Several cook stove models were tested in the laboratory as well as in the field for the selection process. Local preference and ability to achieve the primary objective of reducing IAP and fuel consumptions were the parameters that were considered in the screening process of ICS. Seven different models were tried, out of which three were finally selected.

Key Actors and Their Roles

USAID was the funding agency, while Winrock International was the principal recipient of the fund for the project. Winrock International was formed in 1985 with the merger of three institutions, namely, the International Agricultural Development Service, the Winrock International Livestock Research and Training Center, and the Agricultural Development Council out of Little Rock, Arkansas, USA. It is a global non-profit organization working on social, energy, environment, agriculture, ecosystem, forestry, and other issues in the USA and other countries of the world. Winrock developed the model and provided technical support.

Winrock partnered with VERC, which is a Bangladesh-based NGO. Evolving out of a project work in 1977 under UNICEF's funding, VERC got officially registered as an NGO in 1981. VERC focuses on people's participatory development work. It has been working on ICS since 1987 and is the leader of a National ICS Network that has 93 partners. MPA is a collection of tools developed for the World Bank's Water Supply and Sanitation programmes applied to participatory processes. This was adapted by the Asia Regional Cook Stove Programme (ARECOP) network. VERC, as a partner of this network, received training in using this methodology for household energy. VERC was responsible to identify the need, selection, and marketing of cook stoves through community participation using MPA. It also took the lead in entrepreneur development.

The other partner, Concern Worldwide Bangladesh, is a sister partner of the Irish NGO. It started working in Bangladesh before the country gained independence in 1971. The focus of their work has been on relief, rehabilitation, and development. It helped those people of Bangladesh who migrated to India as war refugees. Later on, it started helping the Urdu-speaking Bihari communities living in the urban areas of Dhaka, Saidpur, Khulna, and Chittagong. The organization worked in Saidpur and Parbatipur under the USAID-funded municipality partnership child survival programme (CSP) and had prior experience in awareness building. It was responsible for developing and disseminating the behavioural change activities for the IAP reduction programme. Appropriate Rural Technology Institute (ARTI), based in Pune, India, led the testing activities for cook stove selection. It also provided a cook stove variant for the programme.

Due to varying demand-supply situation of biomass from region to region, local information feed from all strata of society is very important to develop an IAP mitigation process. Community leaders play vital role in any change taking place in the neighbourhood due to economic, social, and political interests.

The success of the project was tied to community participation. At all stages of development, ward commissioners, municipal officials, social leaders, health workers, artists, and general members of the civil society were involved through various committees, courtyard meetings, private consultation, and other decision-making processes.

Project Implementation

The project began with a baseline household survey and measurement of IAP in a few selected houses. A total of 625 households in 13 clusters from five wards were selected on the basis of household earning (less than $2 per day), cook stove type, use of fuel type, kitchen/house structure, cooking practices,

number of family members, and so on. The wards were selected after consulting local municipalities and Concern workers.

The average household members in Saidpur and Parbatipur were found to be 5–6. Respondents in Saidpur had greater access to electricity than Parbatipur by a ratio of 72 to 44. On the other hand, average earning by Parbatipur households was marginally higher than that of Saidpur. Except a few, the kitchens did not have any window, while majority of them had only one door. Because of the congested nature of the kitchens, cooking was predominantly done outdoors using traditional portable, one-pot clay stove. Wood (46%), rice husk briquette (18%), cowdung cake (13%), and bamboo (11%) were the mixture of fuel used in the target areas. One third of the households bought these on a daily basis and another third once or twice a week. Only 10% of the households depended on gathered fuel.

The survey found that the cooks (90% women) were well aware of the smoke hazard of cooking. They complained of headache, blood pressure, breathing difficulty, eye soreness, coughing, and so on. However, they were not sure of the extent of damage caused by IAP. Women with young children reported presence of their wards around them during cooking (3–4 hours), and also revealed that the children suffered from pneumonia, running nose, fever, eye soreness, and respiratory difficulties.

Almost all the respondents agreed on the positive impact of reduced smoke on their health. The typical existing measure to reduce smoke was to use dry fuel (59%). Some respondents (12%) had switched to cleaner fuel. The survey clearly established the need and opportunity for ICS to significantly reduce the IAP exposure of the respondents.

The baseline pollution monitoring was calculated in 42 households for a period of 24 hours both inside the kitchen and outside the cooking space (USAID-Winrock 2009). Carbon monoxide and PM 2.5 were measured to understand the level of air contamination. It was found that over a 24-hour period, the average concentration of PM 2.5 for cooking areas was 340 ± 344 $\mu g/m^3$ and 294 ± 319 $\mu g/m^3$ in Saidpur and Parbatipur respectively. Pollution level in Parbatipur was less due to relatively more sparsely located houses than Saidpur. However, this level is way higher than any world standard (for example, USEPA 24-hr average ambient standard is 35 $\mu g/m^3$). PM 2.5 concentration, even in the living areas, during non-cooking time was 4–5 times higher than the permissible limit. The average carbon monoxide concentration was found to be at a much lower level than the USPEA 8-hour average limit of 9 ppm, except between 7 am and 3 pm. The survey corroborated the well-established IAP results found in literature.

Financial arrangements

After initial testing and screening, three kinds of stoves were offered as part of the programme. These were BCSIR 1-pot portable, BCSIR 2-pot fixed with chimney, and the portable VERC/ARTI Grihalakshmi model. The prices for these stoves varied between $ 2 and $ 7.5 depending on the type, quality of the material used, installation area, labour cost, transportation cost, and mode of installation (USAID-Winrock 2009). Customers could order from an installation expert on a turnkey basis as a package deal or buy the stove components individually and employ a stove maker to install it. This flexibility allowed all customers to meet their ability to pay for stoves.

No financial support was offered to the consumers to purchase the stoves. Cost of the stove was always thought to be the main barrier for the poor households, who earned less than $2 per day. Stove traders were trained on how to price the product. Yet there were some resistance to a one-time payment. Entrepreneurs offered payment in instalments to promote their business. This resistance gradually diminished as the associated health benefit and fuel savings were corroborated by the early users.

To gain support and involvement for the ICS new business from the traditional stove makers and component manufacturers, financial support was required. A revolving seed fund was managed by VERC, disbursing loans to old as well as new entrepreneurs. The fund was mainly used to buy raw material for the stoves (for example, iron grate and pipes). A minimum of 10% saving was required by the loan recipient. The amount disbursed varied from $57 to a maximum of $ 700 (USAID-Winrock 2009). This loan was recovered in 45 instalments in one year at a 12.5% rate of interest. Each payment was preceded by a meeting of the group of loan recipients in a manner similar to other micro-credit programmes already established in Bangladesh. Only local people who were able and knowledgeable in the ICS technology qualified for the loan. Business experience, some additional income, and fixed assets were considered as additional qualification. The repayment rate was close to 95% (ESMAP-World Bank 2010).

Capacity building, skill building and training of local community

The project, guided by the MPA tools, adopted a bottom-up approach. VERC's experience in sanitation programmes in Bangladesh was helpful in acquiring community involvement in the project. Concern had experience in the area via USAID-funded Child Survival Programme (CSP) that was supported by the local municipal government. Under the aegis of CSP, they organized local volunteers and ward-level health committees to disseminate the message on children health across the community. The same vehicle was used for the stove programme.

Using the MPA tools, 13 community management committees (CMC) were formed, whose members included teachers, community leaders, women, and young men. One member of the ward health committee (WHC) was also included in the CMC to coordinate the activities of the two committees. CMC took the leadership in all intervention decisions regarding the cook stove, and was instrumental in IAP-related awareness campaign.

Following one-to-one discussions with a few selected personalities in the civil society and local government, Concern and VERC officials worked together to conduct orientation programmes in Saidpur and Parbatipur with ward chairmen and commissioners, local community leaders, government administration, health department, and volunteers to introduce the project objectives. It was important to sell the idea to the entire community for not only the use of local resources, but also to remove all doubts regarding breaching someone else's interest.

CMC members, programme officers, health workers, and other interested individuals decided on the modality of the awareness campaign and its content. Heath workers disseminated the messages to the community. Billboards, leaflets, and posters were designed by local artists that highlighted the benefit of ICS and the ill-effects of smoke exposure. Child health, kitchen cleanliness and hygiene, ventilation, and fuel use were the other themes of raising awareness. Using MPA tools, VERC, along with Concern, employed other effective awareness building programmes such as courtyard meetings of households,

folk songs and drama programmes, film shows, and seminars in schools and colleges. Priority was given to local resources (human skill and concepts, materials and themes). Interested people not involved in the project were encouraged to participate in these activities along with volunteers, entrepreneurs, and health and social workers. CMC held weekly meeting to discuss the progress of the project, and addressed any issue raised by the stakeholders.

Billboards, booklets, and posters were used to market the cook stoves in the area. The commercial approach of the projects supported the selling of the stoves to other customers both within and outside the project area. Three big billboards were erected at key intersections for maximum exposure. The project also set up demonstration centres in different wards. Prototypes of all three cook stove models were shown to people and the details of the functions were explained at these centres.

VERC provided training to the people involved in the entire supply chain of cook stove delivery. Three types of entrepreneurs were included, namely, entrepreneurs who manufactured the components, installation entrepreneurs who bought the components and installed the stoves on a turnkey basis, and retail entrepreneurs who sold the components. Basic skill development, both technical and non-technical, book keeping, and pricing were the key components of the training. In total, 25 entrepreneurs were qualified to receive training. Existing entrepreneurs and new aspirants in cook stove business were both included in the training programme. The trainees were all women as VERC's policy allowed loan to women only. However, male members of the family were allowed to take part in the training and provided vital support to the business. Due to the delay in the implementation phase and unforeseen technical problems encountered during the early phase, refresher courses were conducted for the entrepreneurs. Training was also provided to the early awareness campaign volunteers.

Technology development and innovation

Cook stove research in Bangladesh started before the country gained its independence. In the early'80s, BCSIR came up with several ICS models addressing the flexible requirement of the consumers. The focus of the stove development programme was to reduce biomass use, and improve IAP effect on human health. Since 1994, almost 200,000 of their stoves have been installed under government funding. Still, their use could not be popularized among the users despite good performance.

ARTI also has extensive research experience in cook stoves. It has developed facilities to conduct performance test of the stoves to measure emissions, and conduct standard kitchen performance test (KPT) and water boiling test (WBT).

The project selected seven stoves, including the traditional tri-stand, single-pot, clay cook stove for testing. There were three models from BCSIR and three from ARTI designed along the lines of VERC models. Demonstrations of various operational and maintenance aspects of the ICS models were conducted by VERC. After consultation with the participating slum dwellers and keeping in mind performance and cost effectiveness, three types of stoves were offered to the consumers. The 2-pot fixed model was the most expensive one, costing about $7, while the other two models cost $2 each. The entrepreneurs charged higher while installing outside the project area—sometimes even double, depending on the distance.

Consumer preference was mainly based on convenience of use. Despite predominance of the practice of outdoor cooking, the most popular choice was BCSIR 2-pot fixed model with chimney (62%) that is installed in the kitchen. It indicates that if the IAP issue is properly addressed, women prefer cooking indoors. The next model chosen by the users was BCSIR 1-pot portable model. The third model selected was the portable VERC Grihalakshmi that was modified from the fixed ARTI Grihalakshmi model. VERC model was chosen due to the ease of using the smaller pot.

According to ARTI laboratory and onsite tests, the reduction in PM 2.5 by the ICS models varied from 37% to 85%, and CO by 65% to 99%. The BCSIR 1-pot model was the best performer in terms of reducing emission over the traditional 1-pot model. It reduced both PM 2.5 and CO by 85%. The thermal efficiency of BCSIR models was almost double (25%) of that of the traditional version (13–15%). The fuel consumption of BCSIR 1-pot, 2-pot, and VERC Grihalakshmi was 35%, 29%, and 50% respectively.

All the models required some behavioural change in maintenance, as compared to the traditional stove. Regular removal of ash and proper placement of the grate are mandatory in all three models for their proper functionality. It is important to keep the chimney clean for the 2-pot model. Otherwise, due to reverse draft, heavy smoke fills up the kitchen area. This model also requires that the opening between the two stoves does not get blocked. Some user modifications of the installed model have been reported. Certain families have converted the 2-pot model into a 3-pot stove by attaching a 1-pot stove, while some have used less expensive fire clay grate instead of the standard metal one in the 1-pot models.

Results and Impacts

Achievements of the initiative

The project accomplished its primary objective of reducing the adverse health impact of IAP by introducing ICS to the peri-urban slum dwellers. The project also achieved the goal of sustainability by implementing a commercially viable business model.

Community mobilization was key to the success of the project. Thirteen CMCs were formed in the 13 clusters of houses that were selected for the project. The CMCs played a vital role by taking the ownership of the project. VERC staff coordinated the communication among different groups, and was always present to help the CMC members in monitoring, troubleshooting, and planning the course of the event. The entire awareness campaign was successful from the beginning and thus helped in implementation of the project without any resistance from any quarter of the society. Continual feedback from volunteers, administration, and entrepreneurs show that not only the target group but also the community in general is quite aware of the IAP problem and know of the available options. Increasing orders for cook stoves from people outside the project area further support this finding.

Indigenous design of the cook stoves and adaptation to the local biomass demand-supply scenario, along with the flexibility of use made it easier for the participants to accept ICS. Initially, there was an expectation from the households that some sort of subsidy would be given to them for the purchase of the stoves. The amount of money they were willing to pay for an improved model was one-fifth the price of the cheapest model. Loan programme and training to the entrepreneurs with multiple options

to the consumers for payment, technology, and installation were instrumental for the success and sustainability of the project.

Benefits for key actors

It is too early to measure the long-term impact on health of the targeted group. Properly used improved cook stoves visibly and measurably reduced the emissions leading to a lot of relief to the households. A moderately large number of women are now cooking indoors, using 2-pot fixed stoves with chimney. Lab and field tests showed clear reduction in cooking time and fuel consumption, although the impact of these results on the actual lifestyles of the beneficiaries is not known.

VERC and Concern learned from the successes of the project, especially the importance of combining appropriate technology, practical financing, and community participation in a structured manner.

Enabling Environment and Barriers

The project was initialized by USAID after studying and learning from previous donor-driven attempts in promoting improved cook stoves. Technology focussed on fuel saving, while neglecting the health impact of IAP and not understanding the community perspective did not produce the expected results. Before the mid-'90s, thousands of cook stoves were installed in Bangladesh either free of cost or at a high subsidy. However, this did not impose any sense of ownership among the recipients. As a result, most of the users went back to the traditional way at the first instance of a problem.

This project addressed all the issues that were neglected before. It started by clearly identifying the trouble faced by the community from IAP resulting from inefficient cook stoves in a congested living area. The community education and awareness building was done using tested participatory tools. The community bought the idea and agreed to try the solution. There were some difficulties initially, but when the effectiveness of the IAP solution was demonstrated to the community, interest in ICS was enhanced. Active participation in the selection process of appropriate ICS enhanced the sense of ownership by the stakeholders.

Market demand created through intervention must be supported by a commercial chain of supply. The project ensured an enabling commercial environment by training technicians and entrepreneurs on basic skills, book keeping, pricing, and customer handling and promoting micro-enterprises for the supply of cook stoves. Micro-credit was provided to the entrepreneurs following tested lending models.

Key Lessons, Continuity, and Replicability

Continuity/sustainability of the initiative

The project generated enough interest among the community members to maintain a demand for improved cooking technology. The participation of the existing health committee members and volunteers, community leaders, teachers, and students ensured that the knowledge imparted during the awareness-building campaign and the implementation phase were retained in the collective memory of the community. Demonstration of the positive results by more than 600 ICS installation under the

project implanted the seed of trust. To augment and sustain growth, creation of a group of entrepreneurs was the most critical component of the project.

VERC supports the growth of ICS in the region. The ICS installation has now reached 1,550 in the project area. Presently the 2-pot fixed model costs about $12. VERC still provides liaison between the entrepreneurs and customers. The initial revolving fund of $3,000 for loan is growing, and VERC manages this fund in the same manner as ICS-related loan programme in the area.

Concern and VERC are both active NGOs with lot of experience in development work in Bangladesh. Concern's health programme (CSP) under USAID in north-west Bangladesh has been expanded to several new municipalities. Its experience in IAP mitigation through ICS has made the organization confident to replicate similar programmes in the region and other areas where it has a presence.

VERC has been working on ICS since 1987. The experience from this project was a turning point in its approach. It is replicating the commercial model component of the project in all its new ventures. Social marketing is also being modified according to the lessons learnt from the Saidpur-Parbatipur experience. It is expanding its activity in the north-west and other areas, especially at the divisional headquarters. Large-scale expansion is taking place at Rajshahi, Chittagong, Savar, and Lalmohan areas. The cumulative ICS installation has reached 20,000 till date. The USAID-Winrock project experience has helped VERC secure additional funding from other development agencies.

Training the entrepreneurs has also been key to ensuring sustainability. Training was provided to three kinds of entrepreneurs—manufacturing, installation, and retail. Manufacturers of different stove components sell their items to retail sellers from whom the installation entrepreneurs buy the required components. For all three groups, preference was given to those who were already somewhat involved in similar manufacturing (for example, training in stove exhaust pipes were provided to rural sanitary ware manufacturers utilizing the skill of cement casting) or retail business. For installation, traditional cook stove makers were given priority. In all segments, enthusiastic newcomers were also selected on the basis of certain financial and physical ability.

Because VERC has a policy of providing loan to women only, all 25 entrepreneurs who qualified for receiving micro-credit were women. Loan was provided only when the total savings of an entrepreneur was at least 10% of the requested loan. For social and practical reasons, some male family members were allowed to accompany the female trainees. All the trainees had to be residents of Saidpur and Parbatipur.

A total of 8–10 manufacturing and retail entrepreneurs are still in the business operating at various levels of activities. Apart from a few, all the installation trainees are continuing their roles. All of them have experienced observable economic growth since 2007. Their standard of living has also improved considerably. Most importantly, the confidence level of employed women has risen, and they are venturing out into other businesses and economic activities. They also act as role models in their society by helping others as well.

The following findings were important for the success of the project:

- Selection of appropriate partners with relevant work experience;

- Clear planning/coordination of the sequence and timing of events, and defining the role of partners;
- Using existing system that is relevant to the work (for instance, using community health workers who were already spreading health education for infants to mothers and young children);
- Selection of appropriate local leaders who would own the idea and guide the community;
- Properly paced and targeted small activities work better than large-scale general activity;
- Use of local theme, human resources, skills, ideas, culture, and ingredients is of utmost importance;
- Adoption of technology by a community requires the flexibility of local adaptation. Early local input in technology selection makes it easier to implement it later;
- Proper specification, design, testing, and performance of the product must be ensured; and
- Any technology (product) intervention requires the support of a commercial framework of business that has to be developed simultaneously.

Social marketing was key to the successful change of energy use practices in this case. It evolved as a tool to sell ideas to consumers. The purpose of such effort is not to make profit, but benefit the users. The common practice of cooking in developing countries using biomass has been followed for hundreds of years, but is not necessarily a very efficient practice. To change any long-term habit, one needs to motivate the society. Hence, the role of social marketing in behavioural change becomes most significant. Any change faces strong resistance—be it using ICS or shifting to CFL. Initial high cost, breaking of old supply chain, new skill learning, and many other factors act as barriers to change. Proper planning, training, motivation, local cultural considerations, technological adaptation, and so on are required to overcome these barriers. Without active participation of the target society, no new idea can be sold to them.

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ANNEX 7 | MOBILE RETAIL DEALERS (MRDS) FOR DISTRIBUTING LPG BOTTLES IN BANGLADESH BY TOTALGAZ

Snapshot

TITLE OF INITIATIVE	MOBILE RETAIL DEALER (MRD) FOR DISTRIBUTING LPG BOTTLES IN BANGLADESH BY TOTALGAZ.
Objective	To increase LPG use among the small and medium entrepreneurs (SMEs) by enabling the reliable home delivery of refilled bottles.
Region	South Asia
Country: city, state	Bangladesh: Dhaka, Chittagong, Rajshahi, Khulna, Barisal, Sylhet, and Rangpur.
Urban poor	The MRDs target people who are using biomass or kerosene for either household cooking or commercial purposes such as restaurants/bakeries/eateries. These people mostly live in major city suburbs or relatively underdeveloped areas, where infrastructure support is poor. But they earn a reasonably high monthly income. There are also a large number of households and restaurants within the main city area who do not have pipe gas connection at their respective establishments. There is no gas pipeline connection in the Western part of the country, except in one or two towns (such as Bogra) under the Rajshahi, Rangpur, Khulna, and Barisal Divisions. In these parts of the country, the entire population is probable user of LPG.
Duration	2005–present
Key stakeholders	The key stakeholder in this project is TOTALGAZ, a multinational energy company involved in LPG distribution in Bangladesh. Distributors, dealers, and low-income, limited-skilled people seeking employment opportunity also have important stake in this project. The other stakeholders are urban, lower-middle-class households without pipe gas connection, and SMEs. Expansion of LPG is also a demand of the environmental groups, who want reduction in biomass use.
Current status	There are 20 official MRDs operating mainly in Dhaka. The unofficial number of MRDs is approximately 75. The programme is expanding under official supervision. There are plans of adding two more MRDs in Chittagong in 2010, but unofficial expansion supervised by individual distributor or fixed-shop retail dealer has been faster and more widespread.

Background

Bangladesh is rich in natural gas. Way back in 1968, Titas Gas Distribution Company, the largest in the country, began linking households with gas connections. Since then, about 2 million households have been provided gas connection for mainly cooking purposes. However, till date, the total number of users is less than 5%. About 90% of the population uses biomass for cooking, while a small, relatively affluent section uses kerosene.

Given that Bangladesh has faced a gas shortage problem since 2006–7, interest in using LPG has increased. The government has also promoted LPG to discourage deforestation and use of pipe gas for cooking. After the 1996 Energy Policy was revised, LPG marketing was opened up to private participation.

TOTALGAZ began its operations in August 2002, with a 50,000-tonne-capacity bottling plant in Chittagong. It is currently the leading brand in the LPG market, with a customer base of over 350,000. The total market potential for LPG is estimated at 300,000 tonnes. Current consumption is about 60,000 tonnes per year. The chief providers are Bangladesh Petroleum Corporation, the state distribution company, and four other private companies.

The inability of achieving the full market potential prompted TOTALGAZ to devise innovative ideas in order to expand their operations. As a result, the mobile retail dealers (MRD) concept was developed that won the Idea 2005 Award from TOTAL corporate headquarters under the sustainable development category.

Quality energy access is a challenge faced by many city dwellers in Bangladesh. Despite the existence of an extensive gas pipeline network in major cities and towns in the eastern region, a number of households and commercial entities do not have gas connection. The network is now expanding to the west. People rely on either kerosene or firewood, but LPG offers them an environmentally friendly and convenient alternative. The obstacles to LPG use have been lack of reliable supply and the inconvenience of collecting refill bottles from the dealers.

The marketing group at TOTALGAZ conducted an extensive market survey in 2004 as part of formulating a market expansion strategy. The survey revealed that a substantial number of restaurants, bakeries, and tea stalls used either firewood or kerosene, and were unaware of the availability of LPG as an alternate source of energy. In the early training programmes on operation and safety of LPG cooking for the homemakers, the team also received feedback on difficulties faced while carrying refill bottles. As a result of these research findings, the sales team thought of sending their representatives door to door. Several small and medium entrepreneurs (SMEs) agreed to use LPG if home delivery and reliable supply were ensured. The idea of MRD evolved from these exercises, and was officially launched in 2005. Although the initial market survey and analyses started in 2004, the official MRD programme started only in January 2005.

Project Description

The main objective of the programme was to encourage use of LPG among people who do not have pipe gas connection in major cities, district towns, and villages by ensuring home delivery of the LPG refill bottles and establishing new connections. A related objective was also to generate employment for the poor.

The principal target group were SMEs in charge of commercial operation of hotel, restaurants, bakeries, and tea kiosks that used either firewood or kerosene. A secondary target was household LPG users. Given that LPG users for household cooking were already visiting fixed retail dealer shops and distributors to collect LPG bottles, they also formed part of the target.

In the 2004 market survey conducted by TOTALGAZ's sales team, it was found that there was a demand by the homemakers and restaurant owners for home delivery of LPG refill bottles. The idea of MRDs evolved from this survey. The company then allocated budget to materialize the idea. Two distributors in Dhaka were selected, with the distributors selecting one dealer each who they could trust. The sales

team and the distributor explained the tasks to the dealers. The company provided them with rickshaw vans that initially cost about $175. The dealer did not have to pay any money.

During the initial stages of operation, two dealers worked on a monthly salary of $ 45. After a few months, the payment arrangement was changed to a fixed commission of 36 cents per bottle. The distributor received the same amount as his commission. The local market price for a 12 kg bottle depends on the international price. Currently, these sell for $ 12.85 each.

TOTALGAZ's initial approach was to target the SMEs for market expansion. This strategy has not changed. Company sales personnel continue to survey new areas of the country and aim to develop at least 300 SME customers through new contacts or old connections for the MRD. TOTALGAZ has concluded that for an MRD to maintain a reasonable livelihood, he needs at least 300 customers. Once the customer target is achieved, a local distributor can be offered the MRD option. To attract new clientele, TOTALGAZ distributes free burners and regulators to first-time customers.

Key Players and Their Roles

The main player in this case study was the sales team of TOTALGAZ. There was no involvement of any utility, NGO, local government or community as a collective. The initiative was a business development strategy by a private organization. The MRDs were selected locally by the owner of the distributorship, who knew the MRD well enough to trust him with the task. The distributor explained the terms and condition of the business.

Initial financial support was given by TOTALGAZ. They also provided training at the early stages of the programme. The sales officers also helped them identify the target group. The MRDs were monitored by the TOTALGAZ sales personnel.

Project Implementation

Regulatory and institutional arrangements

There are no regulatory restrictions surrounding MRD operations. The Department of Explosives stipulates a license if 500 kg LPG or more is stored or moved. The rickshaw van typically would carry about 6 bottles, while a bicycle will carry two bottles.

There are some restrictions on the movement of rickshaw vans in select city roads. On these roads, rickshaw vans are only allowed between 10 p.m. and 8 a.m. The van operators sometimes face police intervention during the restricted time period.

The MRD works under the direct supervision of distributor. Generally, the deliveries are made during the day. The customer either contacts the distributor or directly deals with the MRD. Recently, six 24-hour shops have been opened mainly for the benefit of the SMEs who run business late in the night. The mobile numbers of the MRDs of these shops are posted. The overall operation is monitored by TOTALGAZ.

Financial arrangements

TOTALGAZ financed the project. In its early stages, the rickshaw van or the bicycle was subsidized upfront by the company, in the form of a grant. Later, this was changed to 80% financing by the company, while the remainder was paid by the distributor. Now, the initial investment is undertaken by the distributor.

The change in the financing arrangement occurred when about 4–5 MRDs fled with the rickshaw vans and a couple of cycles were stolen. Now, the distributor finances the purchase of the rickshaw van, and after three months of operation, the company reimburses 80% of the cost.

Capacity building, skill building and training of local community

There were no training provisions for the local community. Initially, MRDs were trained for two weeks on safety and technical issues. However, this was discontinued as most of the new MRDs were the employees of the particular distributor and had been trained by them on the job.

Results and Impacts

Achievements of the initiative

In an energy-starved and poor country like Bangladesh, where 90% of the people use biomass for cooking, LPG is a quality alternate. The government, NGOs, and environmental groups are all promoting the wider use of LPG for cooking purpose. When TOTALGAZ's growth began to stagnate, the MRD programme opened a new window for business expansion. It considerably increased the sales of LPG, and thereby reduced the use of firewood. The MRD programme was also an excellent opportunity for the poor, who were only educated till basic primary school level, to afford a decent livelihood.

At least 100 jobs have been created as a direct result of the MRD programme. There are more than 5,000 distributors and dealers of LPG retail shops in the country working for the three public companies, namely, Padma, Meghna, and Jamuna, and four active private companies— Jamuna, TOTALGAZ, Cleanheat, and Bashundhara.

Following the success of TOTALGAZ, many private company dealers are now engaging MRDs for their marketing. If one considers all such companies, then the indirect job creation has exceeded 1,000, although none of the other companies have taken up this programme officially. An intense competition has emerged to provide better service to the customers.

There are approximately 20 MRDs officially operating in the country. Informally, however, the number exceeds 75. When distributors found that MRDs were making good business, they started employing them without asking for formal approval from the respective companies. Some of the employers take a small cut from the MRD commission, while others are employed on a monthly salary basis. TOTALGAZ is handing over bicycles to be used by these MRDs to many of these distributors. The bicycles are given to the MRDs based on their performance.

Benefits for key actors

MRDs earn at least $ 80 per month from the commission of LPG bottle sales. In addition, they receive tips from customers. They also sell regulators and connecting pipes for gas stoves. Most of the MRDs possess the requisite technical skills to install a new system, and can offer repairing services to the customers. MRD's can potentially earn as much as $130 per month from these activities. There is an example of an MRD in Dhaka who was so successful that he secured his own dealership and today employs 6–7 MRDs.

Commission-based business offers MRDs incentives to expand their operations, which eventually helps TOTALGAZ sell more LPG cylinders. Busy home makers got a break from the time-consuming and physically demanding task of collecting LPG refill bottles from the fixed retail dealers. The programme has also given them access to easy home service for repair and adjustment regarding LPG use. SMEs who were using either kerosene or firewood for their businesses now have a much-improved odour- and smoke-free working environment. The LPG cook stoves are also more efficient than their traditional counterparts.

Enabling Environment and Barriers

The initial business model of LPG marketing was based on a retail fixed shop. This had some inherent problems—the uncertainty of availability of bottles in the shops and the hassle of exchanging the bottles at the shop. Despite some traditional campaigning, a large number of SMEs were not aware of the LPG service in their area. These problems were clearly identified through a market survey by the TOTALGAZ sales team. The project overcame several of these issues.

The sales team identified potential customers in an area, and involved the distributor by selecting a local person to start the MRD business. The barrier to the potential business was the investment in the rickshaw van or bicycle. This was overcome by financing the purchase of a van. As such, an enabling environment was created by TOTALGAZ. Although, initially the MRDs were employed on a monthly salary basis, it was later on switched to a commission-based business that incentivized the MRD.

Key Lessons, Continuity, and Replicability

The programme has proven to be sustainable. The flexibility of the initial model was key to the project's success. By learning from experience, the initial 100% financing by the company was changed to an 80:20 ratio with the distributor. This increased the involvement and responsibility of the distributor. A three-month waiting period was also added to test the ability and sincerity of both the distributor and the MRD. This eliminated the problems of rickshaw van theft encountered earlier. Switching from salary-based employment to a commission-based independent business model was also a key change adopted in the early stages of the project. This created the opportunity for entrepreneurship.

Although the programme is still being expanded by TOTALGAZ, a much faster informal expansion is taking place initiated by individual distributors and dealers, albeit with a different financial arrangement. As both the distributor's and dealer's commissions are added to the company product price and collected from the consumers, the accounting part of the business is relatively ethical.

The MRD programme started in Dhaka, but has expanded to all areas of Bangladesh where TOTALGAZ has distributors. Currently, it has 150 distributors and 1,931 registered dealers. If the unofficial small dealers are taken into account, the number exceeds 2,500. The distributors and dealerships are mainly located in the divisional cities of Dhaka, Chittagong, Rajshahi, Khulna, Barisal, Sylhet, and Rangpur. Each of the 64 districts has at least one or more distributors, while each sub-division has dealerships. The project was implemented by people who understood the business very well. All the partners had prior experience in the same business, and the sharing of ideas with flexibility in implementing those ideas was the key to the success. Communication and synergy among the training, marketing, and management departments of the company was important in formulating a winning strategy for the programme.

Selection of MRD by the local distributor played a crucial role, because the distributor was aware of the local problems and issues that could be handled by the MRD.

TOTAL's commitment to establish its name as the leading LPG brand in the country was essential for its success. The free promotion, proper planning, constant monitoring, market creation, financial support, and flexibility were a result of that commitment. The model has not only grown within the TOTALGAZ distribution network, but it is now being adopted by various other companies.

ANNEX 8 | COELBA COMMUNITY AGENT PROJECT

Snapshot

TITLE OF INITIATIVE	COELBA COMMUNITY AGENT PROJECT / PROJETO AGENTE COELBA
Objectives	Reduce commercial losses from non-paying, legally connected customers; reduce the number of illegal connections and adjust energy consumption (bills) of low-income consumers to their ability to pay; invest in customer relations through the mediation of agents embedded in communities; use a combined approach of information and energy-efficiency improvements delivered by community agents, together with increased utilization of government subsidies (social tariff); and rely on an intermediary NGO to reach customers and establish a relationship of mutual trust between customers and the company.
Region	Latin America
Country: city, state	Brazil: Salvador, Bahia
Urban poor	About 35% of the population in the city lives at or below the poverty level. Informal slums cover 60% of the city. There are widespread instances of illegal access to electricity in informal urban slums, as well as high levels of inefficient energy use.
Duration	2000–present
Key stakeholders	• Funder: Companhia de Electricidade do Estado da Bahia (COELBA) • Beneficiaries: residents/customers • Implementing agency: Association of Volunteers in International Service (AVSI) and Cooperação para o Desenvolvimento e Moradora Humana (CDM)
Current status	Ongoing in 67 communities in Salvador

Background

The city of Salvador is the state capital of Bahia state. It is the third largest city of Brazil, as well as one of the oldest. Salvador is home to approximately 2.7 million inhabitants across 651,008 households, spread over an area of 707 km². About 35% of its population lives at or below the poverty level, which is defined as $ 960 per year or $ 80 per month for a family of four (IBGE 2000). There are an estimated 357 slums (*favelas*) in Salvador, with around 800,000 people living in conditions of extreme poverty (CONDER 2006). According to a demographic study of the city conducted in 2000, approximately 32.4% of the urban area of Salvador has been informally occupied since the 1940s, which represents almost one-third of the city's population.

Rapid urbanization through extensive informal settlements in Salvador has brought with it associated urban problems such as high rates of unemployment, violence, high population density, poor living conditions, and limited access to regular, quality services including electricity.

The policies of the Brazilian national and state governments towards slum regularization have historically been highly political and sensitive. Since the 1990s, government policies have begun to favour slum recognition and incorporation into the formal cities, and networks of public services. Government policies have continued in this direction throughout the life of the project, with significant advances and investment made by the government at multiple levels.

Upon privatization of the electrical sector in 1995, it became apparent to the utility companies that illegal and irregular access to electricity was rampant that resulted in widespread system losses and significant public safety concerns. At the same time, households were accustomed to high levels of energy consumption due to use of low-efficiency light bulbs, faulty electrical installations, refrigerators

in poor condition, and inefficient home construction with no ventilation or natural lighting. As a result, energy consumption was consistently above the customers' ability to pay. Among COELBA's customers, default rates were around 50–60%.

The configuration and location of dwellings in the urban slums, and the lack of formal property registration meant that basic tools for communication between the service providers and customers—identifiable addresses, roads, telephone, and postal service—were lacking. The environment fostered a conflicting relationship between utility companies and the community, where non-paying consumers preferred to remain invisible and the utility's only recourse to non-compliance was service discontinuation and legal remedies.

Project Description

The COELBA Community Agent project is an electrification and energy-efficiency initiative for low-income areas. It is being carried out by a local NGO, Cooperação para o Desenvolvimento e Moradora Humana (CDM), in the city of Salvador, Bahia state, and is coordinated and financed by the electrical distribution company COELBA. Agente COELBA has been in operation for 11 years, with a pilot initiative in two communities, and is presently operating in 67 communities of Salvador as well as in other cities of Bahia. The programme methodology has been replicated in the state of Pernambuco in Brazil, as well as internationally. Multiple complementary programmes aimed at increasing energy efficiency and conservation have been developed within the framework of Agente COELBA. These initiatives have not only become formalized as stand-alone programmes, but have also expanded significantly and have gained international recognition. The initiative has had a significant impact on the policies and structure of Grupo Neoenergia, which is fully committed to continuing the approach of community engagement to maintain the gains achieved.

Companhia de Electricidade do Estado da Bahia (COELBA) invests an average of R$12.5 million ($ 7.5 million) per year to sustain Agente COELBA and the related energy-efficiency components, and provides employment to 200 people.

COELBA designed and launched the project to increase market reach and improve profits by minimizing inefficiencies. In doing so, COELBA 'maintained a least-cost business approach that was nonetheless cognizant of difficult social and humanitarian conditions, and promoted itself as a service company with an investment and responsibility in the well-being of its customers.'

The objectives of the COELBA Community Agents project were to: invest in customer relations through the mediation of agents embedded in communities; reduce commercial losses from non-paying legally connected customers; reduce number of illegal connections and adjust energy consumption (bills) of low-income consumers to their ability to pay; use a combined approach of information and energy-efficiency improvements delivered by community agents, together with increased utilization of government subsidies (social tariff); and rely on an intermediary NGO to reach customers and establish a balanced relationship of mutual trust between customers and the company.

Key Players and Their Roles

COELBA, established in 1996, is a private, investor-owned distribution utility in the north-eastern state of Bahia, Brazil, and part of Grupo Neoenergia, the third biggest private electricity company in Brazil.

Currently (2010), COELBA has 4.6 million clients spread across 415 of the 417 municipalities of the state. An estimated 50–60% of its clients fall under the low-income brackets (according to federal standards).

COELBA's motivations can be summarized as: regulatory and legal objectives: to achieve 100% coverage, and minimum reinvestment in energy efficiency and R&D; business objectives: to address high technical and commercial system losses, high levels of non-paying customers, and general inefficiencies at all operating levels; and customer service objectives: to ensure satisfaction of poor customers.

From the mid-1990s, COELBA began to devote greater attention to expansion and improved service in low-income communities. In 2000, it intensified its investments in slum electrification and regularization, with particular attention to energy efficiency. The context presented a particularly difficult challenge for COELBA. This is because the company had to overcome the resistance of the population to regularization (fear of high bills and resulting debt, distrust and legal concerns regarding property rights, and resistance to change mindsets), while also finding ways to optimize energy consumption per household and increase the number of paying households.

Neoenergia faced this complex set of challenges at a larger scale, and therefore showed a high level of interest in the success and challenges of COELBA to expand coverage in other urban slums of the state of Bahia, with the objective of expansion to other states that had high levels of low-income customers.

AVSI Foundation (formerly known as Associazione Volontari per il Servizio Internazionale) is an international non-profit organization based in Italy that is engaged in developmental projects worldwide. It had been conducting urban slum upgrading activities in Salvador since 1993 within the area of Alagados, and in other locations of Brazil. In partnership with the state development agency and international donors, AVSI pioneered a methodology of intervention based on the integration of physical upgrading with a strong social component. The methodology implies a process of recognizing the positive aspects in each context, and mobilizing the slum dwellers and their organizations to participate in the physical and social renewal of their neighbourhoods. The Alagados initiative expanded significantly over the years within the state of Bahia and in other states with increased coverage, national and international support, and recognition.

Cooperação para o Desenvolvimento e Moradora Humana (CDM) is a local organization formed in 1995 in Belo Horizonte, the capital of Minas Gerais. The organization has a branch in Salvador, Bahia operational since 1998. CDM has been a close partner of AVSI since the beginning, and has grown significantly in terms of technical and organizational capacity as a result of this collaboration. CDM provides services to communities and the government in the slum upgrading and community development sector. Since 1999, CDM has been the primary executor of the Agente COELBA project, ably aided by technical support from AVSI.

Community associations in intervention areas were key components of this project, guaranteeing implementation and monitoring of activities with a high level of community participation, including

selection of community agents to be hired by the project. The associations also benefitted from the social fund created for reinvestment of financial gains within Agente COELBA.

Project Implementation

For a comprehensive understanding of the complex reality of operations in Brazil's urban slums, COELBA contracted the firm Diagonal Urbana in 1998 to conduct a study to identify the main characteristics of low-income clients and residents in Salvador, and explore alternative approaches for interventions. In 1999, COELBA requested AVSI and CDM to prepare a proposal for a pilot project that could throw light on the following issues and challenges:

- Even after illegal customers have been regularized, it is hard to keep new customers from defaulting or suspending service. The challenge was to improve client-customer relationship;
- Control and reduction of energy consumption are in the interest of the clients, and ultimately in the interest of the company. The challenge was to devise a strategy to adapt energy expenditure to household income, and deal with debts and irregularities proactively;
- Client attitudes and perception of services change over time. The challenge here was to establish channels of communication through representatives of the company who are also trusted by the community; and
- Intervening with only technical support to improve electricity connections and anti-theft kits may not significantly improve payment of electrical bills or reduce illegal connections. The challenge was to implement a more intensive education campaign and ensure direct contact with consumers for effective and lasting solutions.

In 1999, COELBA initiated a partnership with AVSI and CDM to define an intervention methodology that would guide the implementation of slum electrification and energy-efficiency initiative, with the goal of balancing business interests and the explicit limitations of the communities.

CDM and AVSI carried out the pilot project in two communities, namely, Barrio de Paz and Barrio Jardim da Mangabiera in Salvador. Both were characterized by extreme poverty and had high levels of instances of non-payment for electrical supply as well as household electrical consumption. The initial target was 6,000 households. The main activities carried out as part of the pilot project included creating field offices in the two communities, mapping the communities via aerial photography, and conducting a socio-economic survey of residents and situation of electrical service and usage. It also included identifying community associations and players, implementing a geographic information system (GIS) system, and elaborating on the social and educational plan of action for energy efficiency. The activities also supported creating an inter-institutional advisory body to guide implementation, selecting and training community agents, and developing an instrument to support community agents.

Important information on household electricity consumption was gathered through these social surveys. For instance, it was found that old refrigerators accounted for 70% of residential electricity consumption, inefficient lighting accounted for 20.6%, and televisions accounted for 8.4%. This information directly impacted the strategies for energy efficiency.

All stakeholders gained a deeper understanding of the context, and an appreciation of the value of the community-agent approach to establish or restore the relationship between consumers and the electricity company, and to achieve benefits for both. This reinforced COELBA's commitment to invest in this approach on a larger scale.

In 2000, COELBA officially launched the first phase of Projeto Agente COELBA in 11 communities of Salvador, with a team of 19 Agents, targeting 20,000 households. CDM won a contract with COELBA through a competitive bidding process to serve as lead implementer for a project period of 12 months. CDM's role was to hire, train, and supervise the COELBA agents, organize events and educational programmes, participate in planning and further development of the project methodology, and, in general, support COELBA's access, acceptance, and credibility in these communities. The project has gradually expanded over time, as CDM has continued to serve as prime implementer through consecutive contracts with COELBA.

Scaling up and replication

The project has gradually and consistently scaled up the number of communities it reaches. COELBA's commitment to scaling-up was due to the gains in revenue from new customers, reduced levels of customers in default, reduced system losses, and the community appreciation of the initiative. As a result, Agente COELBA became part of the business model of COELBA, as it also became an integral part of the community landscape, ensuring sustainability and continuity.

In 2003, replication of the project began in 10 communities of Feira de Santana. In 2007, replication of the project began in six communities of Lauro de Freitas and Simões Filho.

In 2010, AVSI Nordeste was awarded a contract to initiate a parallel programme with Companhia de Distribuição de Energia Elétrica Pernambuco (CELPE), the sister distribution company of COELBA within Grupo Neoenergia. This project was named Agente CELPE.

Scaling up was a relatively smooth undertaking, made possible due to a gradual process of consolidation between COELBA and CDM. As Agente COLEBA became well-known and accepted by the communities, the barriers to entry in new communities were significantly reduced. On the technical side, the methodology was already tested and refined, which allowed for easier technical planning and implementation. CDM faced the challenge of managing significant and steady growth of operations and structure, specifically in terms of the number of agents, employees, and stakeholders. As the programme becomes established in particular areas, the main focus of the Community Agents, and therefore of CDM, is ensuring sustainability of results, which implies keeping hold of regular clients and ensuring positive reception of the project by the community.

In the state of Pernambuco, the distribution company CELPE launched a parallel initiative executed by AVSI in 34 communities to streamline the methodology, as part of the Grupo Neoenergia's policy approach to energy efficiency in low-income communities. The previous collaboration of AVSI with the government of the state of Pernambuco in slum upgrading allowed for greater collaboration and integration of the project in government's own initiatives and strategies.

Internationally, Neoenergia collaborated with USAID in a replication of the Agente COELBA model in Angola in 2006.

Methodology for implementation

The methodological approach developed for the project involved the following essential components: 1) identifying points of entry in each community by engaging the civil society; 2) empowering residents as key implementers through the Community Agent model; 3) increasing access, quality, and affordability of service provided; and 4) improving energy efficiency and conservation at the household level through direct interventions.

1 | *Identify points of entry in each community*.

Tool: engage civil society/ local associations. Existing community associations are identified and invited to become important collaborators in the project. The associations are given tasks such as publicizing the initiative, integrating the project with the community, facilitating meetings and educational events, promoting the hiring of community agents, participating in evaluation of project, and identifying community problems with electricity supply and services. AVSI realized this aspect of the methodology to be essential for gaining legitimacy and improving the utility's image in the communities, ensuring a high level of participation and communication, and for reducing overall resistance to change.

2 | *Empower residents as key implementers.*

Tool: Community Agent model. Through the community associations, residents are selected to be interviewed for positions of community agents. Candidates submit a CV for review and must pass tests on math and Portuguese language followed by an interview. CDM contracts the community agents directly and provides training together with COELBA, while technical training is provided by COELBA, and CDM provides training on the social and human concerns.

In general, one agent is assigned to each community, with each agent responsible for 2,000 customers on an average (10 visits per day). Agents are properly equipped and uniformed, and their daily work entails advertising the programme, identifying customers, interviewing households for data entry into COELBA's database, and the registry of low-income residents. The data collection effort is essential to establish the basis for communication between the customer and the company, and for customers to benefit from the government's social tariff mechanism. Regular visits from the agents provide an on-going educational process to help new consumers reduce their energy demand through energy conservation, in addition to technical overseeing of installation, meter reading, and upgrading. COELBA agents regularly update the socio-economic information about clients and monitor payment of bills, thereby providing an extremely important service for COELBA.

The agents are supported by a central operating base managed by CDM, which coordinates the geographical reach of the agents and field-level supervision, and supports and streamlines communication between clients and COELBA. The central operating base has primary responsibility of maintaining the client database and facilitating the flow of information from clients via community agents to COELBA (service demands, household level data, and negotiated payment plans), and the information from COELBA to the clients (technical service response, bills, and incentives).

3 | *Increase access, affordability and quality of energy services*.

Tools: Social tariff and installations. COELBA increased the number of legal, regularized electrical connections by responding to the requests for services generated by the community agents. It heavily subsidized the installation of new connections and theft-resistant meters, and facilitated client's registration in the government's social tariff programme. Agents coordinated and monitored the installation process and negotiated tariff collection strategies with households. In this way, low-income clients were able to overcome the barrier to access through a combination of utility-sponsored subsidy and government-sponsored subsidy (social tariff), facilitated by a trusted community agent.

An essential part of the programme methodology was to lend community agents significant authority over the negotiation of special tariffs and debt repayment plans. This resulted in practical payment systems for irregular and low-wage customers, which were an incentive for participation. COELBA took the need to assist households to reduce energy consumption and corresponding bills to affordable levels quite seriously. In this regard, it conducted research and analysis to provide benchmarks for sustainable rates of consumption per household. The result was a model of the 'efficient consumer', who would spend no more than 5% of the family's income on electricity. In addition, the utility has invested in both educational outreach and targeted interventions to improve energy efficiency of its customers.

4 | *Improve energy efficiency and conservation.*

Tool: energy efficiency sub-projects: In the early stage of implementation, the project focussed primarily on education and registration of clients in the social tariff mechanism. It was evident that these initiatives alone would not provide an adequate reduction in energy consumption to effectively improve consumers' ability to pay, and therefore decrease rates of default and outstanding debt. COELBA initiated the idea of sub-projects, which would address different areas of the project's objectives. The first sub-projects dealt with improvement of electrical installations, distribution of fluorescent lamps, and exchange of old refrigerator units. Over time, the number, width, and scope of these projects expanded to large-scale programmes with extensive reach.

Innovative approaches

Appliance exchange: One of the first energy-efficiency initiatives involved the replacement of old appliances—primarily lamps, light bulbs, and refrigerators. Over time, refrigerator exchange became formalized into the project Nova Geladeria, through which the company sold new, high-efficiency units at a fraction of retail costs. In 2006, a partnership was established with the Brazilian Banco Popular to make a subsidy of 60% possible. In 2008, a 100% subsidy was extended to clients meeting the following criteria: having regular electricity connection, timely payment of electricity bills, and registered in the Social Tariff programme.

The old refrigerator units are collected and the scrap metal and chlorofluorocarbon (CFC) gas are sold to raise money for community projects channelled through the Social Action Fund started under the programme. Recycling of CFC gas also has positive impact on the environment.

In 2009, the Nova Geladeria initiative was recognized as an exemplary project by the United Nations Environment Programme.

The ValeLuz COELBA project, launched in 2008 as a socio-environmental initiative that developed parallel to Agente COELBA, is aimed at stimulating the recycling of light bulbs and old appliances. Customers exchange recyclable material for discount coupons that are applicable for their energy bills. Exchange posts in the two participating communities are managed by community organizations, which benefit from the sale of recycled parts and materials.

To date, COELBA has distributed 525, 126 lamps and light bulbs, donated 51,185 refrigerators, and sold 17,726 refrigerators.

Community education: Educational outreach has always been an essential component of the Community Agent methodology. Agents were given the primary responsibility of communicating energy efficiency-strategies to client households, and monitoring use of appliances as well as structural conditions that increase consumption. Agents create a space for on-going education on energy use and compliance with the terms of COELBA's electricity service provision, which builds trust among clients and the company.

Grupo Neoenergia and COELBA have plans to launch a mobile classroom initiative to reach schools and communities in the 53 municipalities across the state of Bahia.

Reinvestment of revenue and savings: A Social Action Fund was created by the Community Agent project as a vehicle to channel funds generated by the sale of scrap metal and CFC gas to address social and economic problems in the communities. The fund was an innovative mechanism that provided immediate reinvestment of the gains of the project into the communities in terms of concrete benefits of jobs and business opportunities for local cooperatives and cultural groups. At the same time, it consolidated Grupo Neoenergia's commitment to social responsibility. Half of the income generated was dedicated to programme costs to continue and expand the initiative, while the other half was dedicated to grants for community organizations engaged in education, employment, and culture. The direct beneficiaries of this fund included CAMAPET Scrap Collectors Cooperative, Paciencia Viva Scrap Collectors Cooperative, Salvador Biscuit Cooperative, and Cultural Group Bagunçaço.

The programmes Nuova Geladeria, ValeLuz, and the Social Fund were expanded to 21 cities in Bahia and Pernambuco, for generating employment and environmental benefits.

Implementation problems and solutions

In the mid- to late-1990s, the *favelas* of Salvador were characterized by high levels of violence and distrust of the population towards external interventions. COELBA faced a serious challenge of gaining trust among residents in order to gain entrance into the communities to initiate a new project. The strategies available to service providers like COELBA to enforce timely payment of service fees were limited to service interruptions and fines. The solution to this challenge required a high level of community involvement, led by respected NGO and CBO intermediaries, to allow for communication and direct engagement of the utility company with residents. The stable presence of community agents, who were also members of the same community renewed and strengthened the relationship between the clients and the company.

Another problem was to negotiate affordable payment plans with defaulting clients who often had outstanding debts. As a solution, the community agents were given increased negotiation flexibility and

authority when working with clients who were unable to make payments or with outstanding debt. The agents were supported by a customer-relationship team based at the central office of Agente COELBA. The team was coordinated by CDM and had authorization for customized payment plans extended by COELBA.

Given the informal nature of the targeted settlements, the creation of a client database that would serve the purposes of the company and client registration in the Social Tariff programme was a significant and on-going challenge. Therefore, COELBA paid attention to improving the customer database and data entry processes quite early, even if it required agents to revisit clients to confirm accuracy and comprehensiveness of data. Through the project, COELBA was able to guarantee to its low-income clients that registration in its database would permit registration in the Social Tariff programme, and consequently lead to benefits in terms of subsidized rates for electricity.

A related challenge in the early years of Agente COELBA was the difficulty of distributing bills to households, and the subsequent monitoring of payment or non-payment. To address this issue, community leaders were given the task of receiving bills from COELBA and coordinating their distribution among customers in the community.

With successful and deep outreach to clients in target areas came the subsequent influx of service demands and complaints. The continued acceptance and ultimate success of the project depended not only on the agents' ability to increase demand, but also on the utility's capacity to respond. In the first year, COELBA achieved a response rate of 60–80% for incoming service requests, depending on the service. To its credit, the company judged these levels to be too low. The solution was to pay attention to customer-service satisfaction and responsiveness, and the technical systems required to attain those objectives. This customer-satisfaction strategy supported a positive image of the project and increased community acceptance.

Results and Impacts

The long trajectory and consistent expansion of the Community Agent project reflects continued investment by COELBA in this strategy due to its high level of success.

Within a decade, Agente COELBA has expanded from reaching 6,000 households in 2000 to 200,000 households in Salvador alone in 2010. Direct employment creation has grown from six Community Agents in 2000 to 102 in 2010, as well as involving 200 technicians.

The indicators that can be used to assess the impact of the Agente COELBA project are:

- Indicators of compliance/ non-default;
- Indicators of energy consumption; and
- Indicators of client visits and service delivery of Community Agents (productivity)

Intermediate results

Intermediate indicators of achievement between 1998 and 2003 were collected and reported by USAID. These reflect important achievements by the project during its first four years that contributed to the sustained commitment of the company to scaling up the effort.

In addition, a study carried out between 2001 and 2002 by researchers from the University of Salvador analysed energy consumption data from 10 low-income communities of Salvador targeted by Agente COELBA. The conclusion was that on average, household energy consumption was reduced by 21% during that time period. The study attributes the combination of educational campaigns and government incentives to the achievement of these results.

COELBA's analysis in 2004 also showed positive results. Rates of compliance—customer accounts in good standing—were significantly higher in service areas covered by Agente COELBA—60.45% of compliance in Agente COELBA areas and 43% of compliance in the remaining low-income areas of Salvador.

Current results

Indicator of compliance/ non-default

Reduction in non-payment and outstanding debt has been a long-standing objective, as well as a continual challenge, for COELBA, It is important to consider that in low-income communities the indicator of compliance/non-default ranges between 40–50%. Taking this into account, in 2004, COELBA set the goal of 75% compliance, or an increase of 35–45% of customer accounts in good standing. In 2007, this goal was essentially met as the average monthly rate of compliance was 74.98%. In 2008 and 2009, the overall levels of compliance have declined each year, touching 70.45% in 2009. Yet, COELBA is still to accomplish a significant increase in compliance through this project in comparison to other service areas.

Indicators of energy consumption

COELBA monitors average energy consumption in the service areas covered by Agente COELBA and the Nova Geladeira project. Recent data on average household energy consumption reveals that while consumption does continue to increase, it is occurring at a rate slower than in previous years.

In 2003, when the project was not integrated with Nova Geladeira, a comparative study was conducted covering data from 2001–03, verifying the reduction in average household consumption in the areas targeted by Agente COELBA in those years. The data shows greater regularity in electricity consumption and a significant reduction in average consumption. In 2003, consumption ranged from 81.11–96.41kW/month, as compared to 2001, when the corresponding figures were 112.67–72.81kW/month (see Graph 1).

In July 2007, COELBA conducted another internal study comparing the project results of 2006 and 2007. For this comparative study, data was collected from a sample of 576 clients from areas targeted by Agente COELBA and Nova Geladeira. In this target area, 17,000 refrigerators and 90,000 CFLs were

distributed. The average consumption of these customers between January and April 2007 showed a significant reduction of 28%—from an average monthly consumption of close to 100kW/month to about 70kW/month. It can be noted that for a family participating in the Social Tariff programme, this reduction in consumption is equivalent to cost savings of approximately 1/3 of the average household electrical bill per month.

In 2008, Neoenergia conducted a similar survey among a group of clients and confirmed a reduction of 33% in consumption as compared to the previous year, and 46% reduction as compared to a projection of consumption without the project intervention (see Graph 3). One study found important behavioural changes among families, which had received a new refrigerator. These changes included increased spending on food, health, education, and clothing, thereby resulting in improvements in the quality of life.

Indicators of client visits and service delivery of community agents

Despite the difficult economic environment during recent years, Agente COELBA continues to address this segment of clientele, which has defaulted on electricity bills. From January to September 2009, community agents completed a total of 76,330 visits to low-income clients. These visits generated more than 82,000 requests for services including registration, debt negotiation, and energy supply. COELBA managed to fulfil 85% of these service requests. As far as clients visited with accounts in default are concerned, the project managed to negotiate a payment plan for 50.1%, thus guaranteeing a recovery of $2,486,706 through debt negotiation, and delivery of information about efficient energy use in the households.

Also, in 2009, COELBA conducted an evaluation of the programme in the community of Mapele, a target community for Agente COELBA. The resulting data from 97% of clients interviewed showed that all of them (100%) expressed willingness to participate in new programmes implemented by COELBA. This finding illustrates the high level of client satisfaction with the actual programme, and significant improvement in consumer perception of COELBA.

Impacts on residents/ customers

The measurement of results by COELBA and Agencia Nacional de Energia Electrica (ANEEL), together with the interviews conducted in October 2010, reveals the range of accomplishments of goals and objectives held by the stakeholders. Feedback from customers and COELBA Agents shows that the project results are verified, and can be proved from the following results:

- Reduction of energy consumption, consequently reducing the amount of monthly bills;
- Increased possibility for household investments in health, education, food, and clothing;
- Receipt of benefits such as new electricity installations, lights, and refrigerator, and improved quality of family life;
- Increased safety and security with regard to rewiring;

- Social Fund from the sale of scraps of the refrigerators and the collective benefits generated by the project through employment and income generation, and generating work opportunities through cooperatives;
- Registration in government programme through Social Tariff mechanism, making households eligible for other social services;
- Empowerment of low-income customers through regularization of bills and participation in the programme;
- Greater awareness among customers about the rational and efficient use of electricity; and
- Emergence of a relationship of trust and loyalty, through the permanent presence of the agent, thereby leading to a positive relationship with COELBA.

Impacts on COELBA

- Economic viability and social sustainability of investments in market expansion;
- Reduction in bad debt and expansion of low-income clients with strong future potential income, linked to strong economic growth of Brazil's working class;
- Improved customer loyalty;
- Improved corporate image among low-income customers;
- Reduced system losses due to illegal connections;
- Positive environmental impact; and
- Advancement of company commitment to social corporate responsibility.

Impacts on community

- Greater purchasing power of residents and increased consumption by the local economy;
- Improved community well-being;
- Increased maintenance of street lighting and other urban infrastructure and services through channels put in place by COELBA Agents; and
- Support for social and cultural programmes through Social Fund.

There were also several unexpected positive impacts. For instance, residents gained 'recovery of citizenship' through the proof of residence using their electricity bills, and through active involvement in the project. High quality jobs were created, directly through Community Agents (who received training, high level of responsibility, authority, and respect in community), expansion of local cadre of electricians, and through the Social Action Fund. Socio-cultural benefits were realized through the participation of community associations and cultural groups. Moreover, associations were enhanced and strengthened as a result of their engagement. Complementary benefits were in the form of increase in household spending on health, education, food and clothing, resulting in improvements in the quality of family life.

Enabling Environments and Barriers

The commitment of Grupo Neoenergia towards providing adequate and affordable electricity service to low-income customers was reinforced by the policy and regulatory environment of the electricity sector in Brazil in the late 1990s. Within a broader context of increasing attention to urban slums' upgrading, the government of Brazil contributed to an enabling environment marked by obligatory investment by utilities in approved energy efficiency programmes, and significant subsidies targeting energy access for low-income consumers.

Privatization of the sector began in 1996, and the Agencia Nacional de Energia Electrica (ANEEL) was created in 1998 to establish and oversee regulated retail tariffs, and promote adequate and competitive services. The concession agreements signed by companies with ANEEL included various obligations. One of these was to dedicate a minimum of .05% of net operating revenues to projects that would reduce energy inefficiency. The Programa de Eficiência Energética das Empresas de Distribuição (PEE) was initiated to review and approve projects submitted by utility companies and to monitor compliance. The Agente COELBA Project was approved by ANEEL as an acceptable investment in energy efficiency for low-income customers, thereby allowing COELBA to meet the requirements for reinvestment in energy efficiency and research.

Another element that was important for the formation of Agente COELBA was the creation of the Social Tariff policy and mechanism in Brazil. Distribution companies were responsible for the identification of low-income customers and the setting of tariffs according to a graduated fee schedule set by ANEEL. In 2002, Electricity Law 10.438 formulated the Social Tariff, which mandated a graduated fee schedule based on consumption, set at the national level and not by individual companies, and accessible to clients meeting certain criteria. Using targeted public subsidies within the system of market provision of services, the Social Tariff further incentivized utility companies to find ways of extending service to low-income residents, thus furthering the policy of regularization of urban *favelas* and improving quality of life for low-income residents. Today, the eligibility criterion is set by Law 12.212/2010 and is based on individual registration in federal social welfare programmes.

The government's role in the Agente COELBA Project has been indirect throughout most of the project's duration. The state government offered a tax rebate on purchases of refrigerators by COELBA/Neoenergia as part of the refrigerator exchange programme.

Key Lessons, Continuity, and Replicability

The Community Agent methodology was an innovative response to the major challenges of slum electrification and a welcome change from the previous attempts to address isolated issues. Selecting community agents from among residents, with the assistance of local NGOs and community associations, and supported by local presence of technical team members was a winning strategy. Agents knew the community members and were aware of the circumstances faced by their clients. Hence, they could communicate at a personal level. Attention was paid to educating agents to adopt a direct approach with clients, thereby providing a basis for personalization in the customer-client relationship. Agents were given sufficient authority to negotiate with clients, and were ably supported by technical and organizational systems, which ensured responsiveness and high levels of customer satisfaction. The establishment of a Central Operating Base by COELBA to collect and direct orders for

service was a critical aspect of the agents' ability to be technically responsive to communities, while also organizing data centrally.

'... We, COELBA Agents, are more than company employees, sometimes even social workers.' -- Joel (COELBA Agent), (while being interviewed by AVSI).

The partnership with experienced NGO intermediaries with a reputation for being trustworthy, effective, and sensitive community participation was particularly important within a context of significant social and economic challenges and limitations. As reported by USAID, 'COELBA tried to conduct the programme in Feira de Santana without using the NGO intermediary, but found that community members were suspicious of the motives and interests of the utility, and lacked the necessary trust to effectively make headway with the programme.' COELBA did not simply outsource a social programme to an NGO in the hope of positive dividends for the company, but engaged directly in a collaboration that was made possible by a consistent flow of communication and commitment of both parties.

'... I'm receiving you today because I have full confidence in the work of COELBA ...' -- Chairman of the Committee, United Pernambués, Luiza, (while being interviewed by AVSI).

Linking regularization of electrical service provision and payment with energy efficiency meant that customers felt the benefits of the programme clearly and directly. As an option, it was more reliable, affordable and safe; there were opportunities to improve the living conditions, education initiatives, and access to registered proof of residence. The greatest impact was felt when services were bundled, with the replacement of old refrigerators playing a large role in reducing household expenditure on electricity.

'... I didn't know why my account was so high, and then came the agent and told me it was my old refrigerator ...." -- Neighbour community Pernambués, Telma (when interviewed by AVSI).

Agente COELBA demonstrated that good relationship with clients, employees, and partners is essential for long-term growth and stability of a business. Relationships based on mutual respect and trust is fundamental to achieving business objectives. The project's approach of direct and meaningful community engagement coupled with the particular characteristics associated with the Community Agent figure helped build and maintain this basis of respect and trust.

Encouraging a sense of shared responsibility and active participation among community members, leaders, NGOs, and business is the most effective way to address enduring and complex problems, and to channel aid. The government's role is essential for creating an enabling environment and shaping incentives. The results of Agente COELBA depended on the people within each of the stakeholder groups (utility, NGO intermediary, community associations, agents, and resident clients) who accepted the challenge of constructing something positive, rather than resorting to the status quo of power relations and conflict. This implied a commitment to deal with issues and challenges as they arose, not through the logic of power and reliance on law enforcement, but instead on the possibility that a mutually beneficial outcome could emerge through dialogue and constructive engagement.

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