# Energising communities in Ethiopia

endev



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# About Energising Development

The Energising Development Partnership Programme (EnDev) aims to provide poor people in developing countries with sustainable access to modern energy services, thus contributing to the achievement of the Millennium Development Goals.
EnDev activities focus on those energy services and resources which are reliable, affordable, socially acceptable, and environmentally sound. Long-term sustainability is a core criterion for activities to be supported within the framework of EnDev and special attention is given to the developmental effects of the energy activities implemented. This means aiming to establish or enhance self-sustaining markets for affordable energy technologies, fuels and services adapted to the needs, without creating a long-term dependency on external donor funding.

The technologies and services predominantly promoted in EnDev's country programmes include photovoltaic energy, grid densification, micro-hydropower, energy-efficient cooking stoves and biogas.

# Introduction

The vast majority of Ethiopians have no access to modern energy sources. They cook on three stone fires, and light their houses with smoky kerosene lamps. The health posts they visit lack the equipment to perform reliable diagnosis and their children cannot do their homework in the evenings.

The lack of access to energy impedes people's chances to prosperity and development. Energising Development Ethiopia aims to overcome these barriers. Over the past six years, it has electrified households, small businesses, health centres and social institutions. Furthermore, it has enhanced the production and sales of improved fuel saving cooking stoves for households and institutions. This brochure is a showcase of Energising Development Ethiopia. It illustrates what the programme has accomplished since its inception in 2006. Moreover, it explains how communities work to achieve lasting results.

The showcase Ethiopia consists of three separate but related stories. The first piece illustrates how the program is changing Ethiopians' daily lives. The second story demonstrates how Ethiopian communities take responsibility for local energy projects. The third story proves the importance of building local markets for energy products to increase the programme's outreach. Above all, this showcase tells the story of parents, nurses, farmers, and local entrepreneurs who have seen their lives changed, or hope to see their lives changed, with the advancement of modern energy in their lives.

By presenting the story of Energising Development Ethiopia, this showcase hopes to inform and inspire policy makers, development experts and an interested general public. The Ethiopian experiences could serve as guidelines, examples and food for thought for everyone who intent to embark on energy projects in developing countries.







# Changing daily lives

The Energising Development programme in Ethiopia reaches nearly half a million people. Having access to modern energy greatly improves their everyday lives and creates new opportunities for education, health care and income generation. Moreover, it encourages people to explore opportunities they have never considered before.

Guye Guje is a contented man. Eight months ago he built a brand new house near the main street of Gobecho village in Ethiopia's Sidama region. The front part of the dwelling serves as a tea room and restaurant. A light bulb dangles down from the ceiling and a radio in the corner plays the latest Ethiopian hits. The restaurant is busy day and night. At an elongated table, five men are sipping their tea. At another table, Guye's wife Fekirte is serving dinner: injera, traditional Ethiopian pancake, with spiced scrambled egg.

*"My house was illuminated with kerosene lamps"*

Guye's fortune changed a year ago, when a small hydropower station was built at the nearby waterfall. From the power station, an electricity line runs along the main road of the village for about a kilometre, connecting houses, small shops, and a school. "I lived two kilometres from here", says Guye. "I did not have a business; I was just helping my father with farming. When the powerhouse was built, we decided to move to the grid." Now Guye and Fekirte have a profitable business. A brand new hair salon, next to the restaurant, is about to open.

*Children play at a waterfall in Gobecho. A nearby plant transforms the hydropower into electricity for their community.*

*Villagers gather at the Gobecho hydropower station. GIZ coordinated the construction; the local community owns the system.*



## Changing daily lives

A few hundred metres down the road, Amarech Shonde, a mother of four, has seen her life changed too after connecting to the grid. "My house was illuminated with kerosene lamps", says Amarech. "They hurt our eyes. And it was expensive: we paid 40 birr (2 Euro) per month. Now we no longer have these expenditures." Like Guye, Amarech has turned her electricity connection into a small business. A sign over the door of her white painted house tells people they can charge their mobile phones here. And they do. Amarech shows the junction box which she keeps in her bedroom. The phone charging business gives her a turnover of 40 birr per month. "I pay 10 birr per month for the electricity connection", says Amarech. "So I make a profit."

### Electrifying rural areas

The Gobecho power station is part of the Energising Development –EnDev- programme in Ethiopia, executed by the German Gesellschaft für Internationale Zusammenarbeit (GIZ). Like 99 percent of the Ethiopians in rural areas, the Gobecho villagers lacked access to electricity. At the same time, the hilly and lush surroundings of their village boast a river with water around the year and a number of small waterfalls. The location, far from the national grid, proved ideal for a micro hydropower station. Since 2010, four micro hydropower stations have come into operation in the Sidama region, connecting schools, churches, small enterprises and households. In Gobecho village, a second power station just came into operation. At this time, over 60 households are subscribed to electricity from this hydropower plant. Over the next years, another 300 households are expected to sign up.

*"We even used our mobile phones as a torch"*

Micro hydropower is one of EnDev's methods to strengthen Ethiopia's production of sustainable energy. A second EnDev-approach is electrification through solar energy. Over the past years, EnDev equipped over a hundred health centres in distant locations with solar panel installations. Like micro hydropower, this immediately impacts the lives of people in remote areas. Nurse Salamawit Betru works at the Sire Goyu Health Centre, one of the locations that received a solar panel installation through the EnDev programme. She recalls how she used to work without electricity in her previous job: "It was very difficult. Many women came at night to deliver

babies. We had to light the room with candles and kerosene lamps. We even used our mobile phones as a torch. We didn't see enough to give good care; we just helped the women not to die. Many of them preferred not to come at all. They just stayed at home and delivered a baby without any medical assistance."
In Sire Goyu those problems have vanished. Light bulbs illuminate the treatment rooms at night. The laboratory staff can test whether a patient has malaria, instead of guessing the diagnosis. Instruments are properly sterilised and vaccines are kept refrigerated. Mothers don't have to walk another ten miles to the district hospital to get their babies immunised.
A third strategy of Energising Development is the reduction of biomass consumption. The majority of Ethiopians use firewood for cooking. Since the mid-nineties, GIZ and the Ethiopian government have boosted the introduction of fuel-saving cooking stoves. The programme is concentrated in the north of the country, were the problems of logging and deforestation are most pressing.

### Clean cooking

Like electricity, the use of an enhanced cooking stove immediately improves people's lives. Askal Mesele, a young woman from Bahir Dar, bought a fuel-saving stove last year. She lives with her mother, six siblings and her daughter on the edge of town and uses the stove to bake injeras for her family and for sale. "Before I baked them on a three-stone fire", says Askal. "It needed plenty of wood and it was bad for my health. I inhaled a lot of smoke and I always had burns on my legs. Now I save about 40 birr (2 Euros) per week, spent on purchasing of fuel wood on markets. Cooking takes less time and it no longer hurts my lungs."

*"Before I baked them on a three-stone fire"*

Not only home users are benefiting. The introduction of fuel saving stoves also creates opportunities for small businesses, like restaurants, and institutions, like schools, prisons and hospitals. At the University of Bahir Dar, a women's association with 121 members runs the impressive university kitchen. It is a long and narrow shed with 56 Mirt injera baking stoves: improved fuel saving cooking stoves for institutional use. The women bake injera's and the morning shift is at its peak. Each cook operates two stoves at a time. From a pouring jug they dispense dough on a round hot plate, cover it with a lid, and quickly move





to the other cooking plate. The finished injera's are piled on huge plates. When a stack of pancakes is likely to topple, a woman puts it on her head and brings it to the storehouse. Every day, this kitchen produces 18,000 injera's for three university campuses. Last year, the kitchen was improved with a new layout and better stoves. Productivity increased, costs of firewood dropped, nuisance of smoke diminished. The association employed 30 women and thinks of recruiting customers outside the university.

### Links between energy and poverty

These everyday life examples show the huge potential of access to modern sources of energy. Throughout developing countries, energy poverty and general poverty are strongly linked. Lack of modern energy puts people at a disadvantage with respect to access to health, water, education, and income generation. Yet, its importance is often overlooked. When designing poverty reduction programmes, power plants, light bulbs and solar panels don't always automatically spring to mind.

*"Lack of modern energy puts people at a disadvantage with respect to access to health, water, education"*

Nevertheless, experts agree that access to energy is a prerequisite for achieving the Millennium Development Goals. This notion is supported by a recent Energising Development Report on Impact, summarising the impact of EnDev projects in 21 countries. The study showed that access to energy affects the realization of every Millennium Development Goal. Incomes increase when

*Millions of Ethiopians cook on three-stone fires. They are dangerous, bad for health and bad for the environment.*

households no longer have to buy firewood and kerosene. Health care improves when hospitals have lighted operating theatres. Education standards rise when children have the opportunity to do their homework after dark. And the position of women and girls advances when they no longer have to spend hours collecting firewood. Therefore, improved access to modern energy should be at the heart of development interventions.

In Ethiopia, the improved cooking stove project has existed long enough to document its impact on users and producers. Both groups respond overwhelmingly positively. Customers save 50 percent of fuel and money on average. They use their savings, among other things, for foodstuffs, education and telephone bills. Women who used to collect firewood save 6 hours on average per week. This time they now spend working in their gardens, looking after their kids, coffee time with neighbours and doing business. Benefits are also there for the producers. By the end of 2011, 565 stove producers were active. Their increased income was spent on more food, support for their extended family and school fees.

*"By the end of 2011, 565 stove producers were active"*

The programmes to electrify villages and health centres have been implemented only too recent to draw conclusions. Nevertheless, villagers, hospital staff and patients report improvements to their everyday lives. In Gobecho village, even people without a connection in their house benefit. The local school director proudly tells that his school started evening classes for illiterate adults. Three times a week, a group of thirty men and women gather in the illuminated library to learn to read and write. A mother of four, too far from the grid to connect, says she sends her children to the library in the evenings to do their homework.

### Invisible impact

Such impact is immediately visible. However, perhaps the most interesting impact is that which is less observable: having access to energy changes the way people think about their lives and opportunities. Take Guye Guje. The idea of starting a restaurant only occurred to him after he had heard about the power station. He is now thinking of buying a television set and a DVD player to entertain his customers. Look, for example, at the local school director in

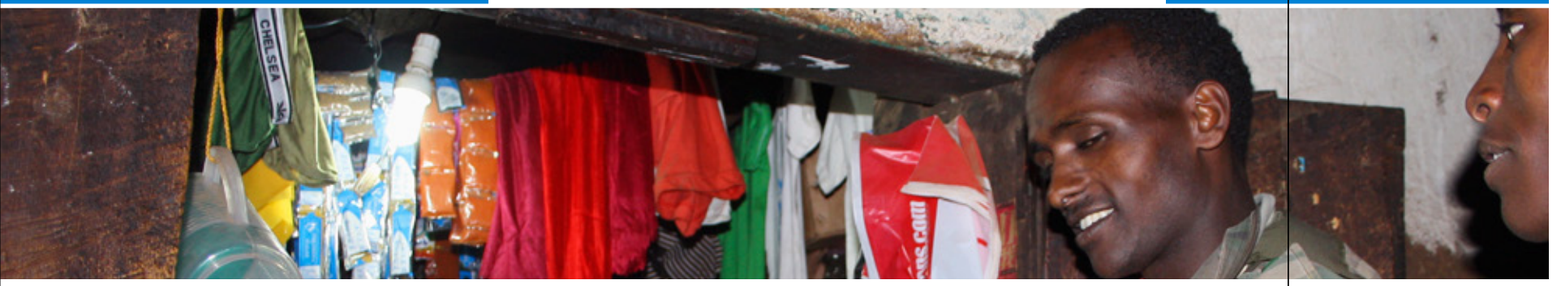




Gobecho. Over the past year, he developed clear ideas about how the use of electric equipment, such as DVDs and computers, could improve teaching quality. When his school had no access to power, he never considered it. In Sire Goyu health centre, the impact stretches far beyond the immediate improvement of hospital care. Nurse Salamawit decided to move there, because there is electricity. With light in her room and a DVD in the main waiting hall, she doesn't get bored in the evenings. Like in other electrified health centres, staff turnover dropped significantly in Sire Goyu.

Gaining access to energy does not just improve people's lives; it induces them to contemplate new options and to explore possibilities they might not have considered before. That, in the end, is a less visible, but tremendous potential of access to energy.

*Guye Guje started a tea room and restaurant after his village got electricity. He turned it into a profitable business.*



# Sustainable access to energy for the poor

Energising Development, or EnDev, is a global initiative that promotes sustainable access to modern energy to the poor. The programme started in 2005 and currently undertakes activities in 18 countries in Africa, Asia and Latin-America. By the end of 2011, EnDev had reached about 8.5 million people worldwide.

Ethiopia is one of the countries with an EnDev programme. EnDev Ethiopia improves the access to sustainable energy through the promotion of micro hydropower, solar energy, and improved cooking stoves. Throughout the country, EnDev has electrified over one hundred health centres with solar panels. In the southern region of Sidama, four micro hydropower stations were built, transforming waterfalls into electricity for local schools, health centres, churches, small businesses and households. Furthermore, EnDev promotes the production and use of improved, fuel-saving cooking stoves. So far, about 430,000 of these stoves have been sold to households and institutions.

EnDev Ethiopia is jointly funded by the German and Dutch governments and implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), together with the Ethiopian government and other partners.  The Norwegian and Irish governments joined the programme at the end of 2011.
EnDev embarks on a market-based approach to ensure the programme's sustainability. Its aim is to boost the energy sector. The renewable energy market offers major opportunities for small enterprises, such as producers of cooking stoves and maintenance mechanics of solar- and hydropower installations.







# Power to the communities

Four hydropower plants in Sidama serve as a pilot project to bring sustainable energy to remote areas. The role of the local communities is crucial in their success. Bart Jan van Beuzekom from GIZ: "We don't want to impose our ideas on the communities. We consider ourselves technical advisors. They own the power station; they are the ones who decide."

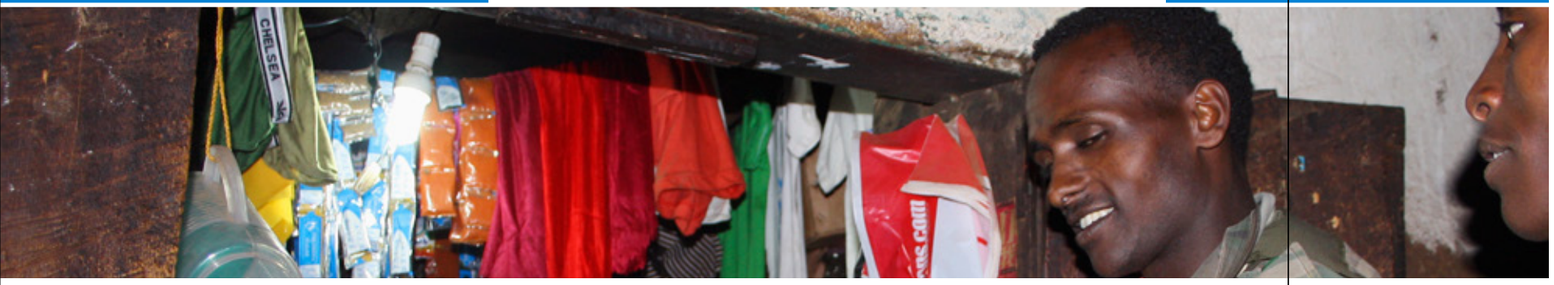
On a sunny Thursday morning twenty men and one woman gather in the tiny government office building in Gobecho village in the Ethiopian Sidama zone. The wooden benches against the wall barely offer enough space for everyone, but people manage to squeeze in and make room for latecomers. These are the members of the cooperative committee of the Gobecho hydropower plant. Chairperson Wondomagegn, an amicable man wearing a white cap, opens the meeting. "Before GIZ came, we were in darkness", he recalls past times. "We could not even see ourselves. Seeing the lights along the main gravel road raised the wish to have light ourselves. When GIZ came to us to talk about hydropower, we were immediately interested."

*"Before GIZ came,*
*we were in darkness"*

The hydropower station of Gobecho is one of the Energising Development initiatives in Ethiopia. Since 2010 the hydropower station literally illuminates the village. Soon, a second power station will become effective in the village. Two other villages in Sidama also have a local micro hydropower station.

*99 percent of the Ethiopians in rural areas lack access to electricity.*

# Sustainable access to energy for the poor



| Energising Development worldwide Quick Facts | |
|---|---|
| Objective | Promote sustainable access to energy for the poor |
| Countries | 18 |
| People reached | 8.5 million by 2011 |
| Budget | 180 million |
| Funding | *German Ministry for Economic Cooperation and Development* (BMZ), *Dutch Ministry of Foreign Affairs* (DGIS) and the *Norwegian Ministry of Foreign Affiars* (MFA). |
| Implementation | *Deutsche Gesellschaft für Internationale Zusammenarbeit* (GIZ) and *NL Agency.* |

| Energising Development Ethiopia Quick Facts | |
|---|---|
| Objective | Promote sustainable access to energy |
| People reached | 314.323 persons, 194 institutions, 560 small businesses by 2011 |
| Budget | € 6.8 million |
| Time frame | 2010-end 2013 |
| Funding | *German Ministry for Economic Cooperation and Development* (BMZ), *Dutch Ministries of Foreign Affairs* (DGIS), the *Norwegian Ministry of Foreign Affairs* (MFA) and *Irish Aid* (specifically the electrification of health centres with solar energy) |
| Implementation | *Deutsche Gesellschaft für Internationale Zusammenarbeit* (GIZ), *Energy Coordination Office* (ECO) |



# Power to the communities

Together, they constitute a pilot project of GIZ and the regional Sidama government. GIZ coordinated the construction of the powerplants and the electricity grids, and trained local mechanics. The local communities maintain the system, attract new customers and set the rules and the prices. If the programme is to be sustainable, they must perform these tasks well.

The achievements after one year are promising. In Gobecho, a school and a number of shops and tea houses are illuminated. A health centre is under construction, ready to be electrified. Seventy households are connected to the grid and pay a monthly fee. Non-payers are warned and fined. So far, the committee only had to disconnect one household. Most villagers have seen improvements in their lives. If they don't have electricity in their house, they benefit from the street lights and the illuminated school, library, and cafés.

The programme has benefited the private energy sector as well. In 2008, 15 people from the private sector, government and universities spent a month in Indonesia to learn about micro hydropower. The private sector participants learned how to construct and maintain micro hydropower turbines. The Gobecho turbine is being maintained by a local company in Hawassa, which has also produced a turbine for the village's second power plant.

Technically, the power station works fine. A local technician is available day and night and even has a bed in the noisy power station. He operates the system, solves minor problems and performs small repairs. So far, the hydropower station has worked well with only minor interruptions.

*"Every connected household becomes a member of the cooperative"*

To manage the system, the villagers have organised themselves. Every connected household automatically becomes a member of the cooperative committee of the power station. Members jointly elect a representative committee. Rather than inventing a whole new structure, the cooperative is closely linked to the existing local government body, the kebele. Some members have a double role in both government, and - cooperative committee. Moreover, the kebele overlooks the election process.

## Connecting the poor

Community involvement, sound financial management and technical capacity are crucial to the success of the hydropower project. But the road to a sustainable power supply in Gobecho village is longer. A well designed and managed micro hydropower plant can operate for 15 to 20 years without requiring any major reinvestment. During the first years, maintenance costs are negligible. But after two or three years, occasional repairs of 5000 to 10,000 birr (250 to 500 Euros) are to be expected. It will be impossible to pay this with the 400 birr (20 Euros) a month that the cooperative now sets aside. "We need to scale up from 70 to 400 customers", says Wondemagegn. "There are enough villagers who live close enough to the electricity line to connect. But the problem is that only half of them have enough income to pay for that connection."

The main obstacle is not the subscription fee of 10 birr (50 Cents) per month, or the registration fees of 20 birr (1 Euro), as most households are used to paying higher monthly kerosene costs. The main obstacle is the connection cost. Before being able to connect to the main grid, villagers must buy wires, a switch and a bulb. Many households struggle to comply with this initial investment of about 20 Euros.

*"There are enough villagers who live close enough to the electricity line to connect"*

Jaleh Dirrah is one of the villagers who fail to purchase these items. The electricity cable runs right above her round wooden house on the main road. A short wire, switch and bulb are all she needs to be connected. "We don't have the cash right now", says Jaleh. "We just renovated our house. That was very costly. But as soon as we have saved some money, we will subscribe."

The outlook for Idaye Wayo, a mother of four, is less promising. Her family has a meagre income from farming. Every month, Idaye pays about 30 birr for the kerosene lamp. A connection to the grid would save money. But Idaye has an extra disadvantage. Her house is about 200 metres from the grid. The wire would need a few extra poles in order to bridge the distance from the main grid to the house. That would bring the investment at 60 Euros, which is a huge amount for Idaye. "I regret not being connected", she says. "But what can I do? I live far from the grid. I cannot afford the materials. And I cannot move closer, because I don't have any land there."





## A fair pricing system

The process of connecting clients and providing service for a fee has another side as well. While some villagers struggle to pay for a connection, others pay too little for their connection. This is one of the issues pointed out by Bart Jan van Beuzekom, a young Dutch engineer working for GIZ, who is responsible for coordinating the construction and setting up the management of the four power plants in the Sidama region through a team of local engineers. He just spent two nights in the village to experience their operation. After all, the plant's impact can best be observed at night. Even though Van Beuzekom is a technical expert, he is very aware of the fact that the human side is fundamental in making the programme work.

"With such a small system and low consumption per customer it doesn't make sense to install a meter in every house", Van Beuzekom explains. "So people pay a flat rate. The agreement is that customers pay 10 Birr per energy savings lamp of 10 Watt. However, some villagers consume a lot more." During a late evening stroll through the village, Van Beuzekom points at a warm, bright glow coming from the crack of a door. This betrays the presence of a conventional 60 Watt bulb. Moreover, loud music reveals that the family uses a radio. "They probably consume about eight times the allowed power", says Van Beuzekom. "But they still pay not more than 10 birr a month."


*A local technician operates the micro hydropower station in Gobecho.*
*He solves minor problems and performs small repairs.*

To make the project sustainable, villagers must pay for their usage. If people consume more than they pay for, the system will use its maximum capacity without having its maximum income. Nevertheless, Van Beuzekom resists the temptation to meddle with this issue. "We have our opinion, of course. We think the committee should further develop the service packages they offer to their customers as well as their pricing strategy and other rules. They could, for example, ban the use of old-fashioned bulbs, or limit the power consumption through fuses. We will advise the community on setting and enforcing these kinds of rules, but we don't want to impose a system on the community. They own the power station. Besides, we are never sure whether our ideas are better than theirs. It could be very harmful to push our plans. All we can do is raise awareness, point at the possible consequences and have a discussion. But the community decides."

### Solidarity

In the crowded government office, Van Beuzekom and the cooperative committee talk about the topic of pricing. Chairman Wondemagegn says he is willing to look at the issue. Nevertheless, he seems to have another priority: getting the poorest households of Gobecho involved. The committee realizes all too well that they are needed to make the project financially sustainable. Moreover, the source of wealth puts feelings of solidarity in the village under pressure. "The power is not equally distributed", says Wondemagegn. "Those who have light are happy. But the power is not equally distributed. There are many grievances."

*"The power is not equally distributed"*

To allow more people to take advantage of the system, the cooperative must lower the threshold for the poorer families. The committee has some ideas of how this could be accomplished. Microfinance institutions, for example, could provide loans to poorer households to pay the initial investment. Moreover, the cooperative wants to invest in machines to process locally grown coffee and cereals. Farmers could sell these processed products at a higher price and improve their profits. Their revenues could be used to pay for the power connection. "We cannot connect them right now", says Wondemagegn. "They first have to become richer."

Attracting capital for local business development is often difficult in rural areas.



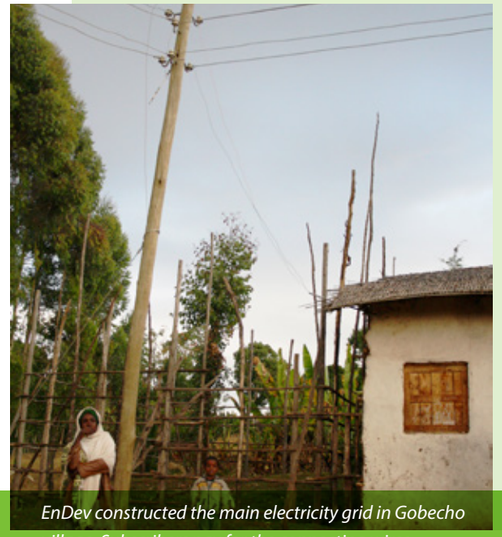


But in Gobecho, the micro hydropower plant represents around 100,000 euro of capital. The very much needed finance for productive use could be based on the hydro assets as collateral. At the moment, the cooperative discusses its plans with a microfinance institution, who might be interested in providing loans for machines.

With commercially based initiatives like these, the hydropower projects in Sidama are expected to attract enough clients and earn enough income for maintenance and repairs. Ultimately, there should be a growing demand from local communities in the region to have a micro hydropower plant, and a mounting number of local mechanics capable of constructing and maintaining such installations at a fair price. Finally, the regional government should have enough experience to facilitate the scale-up of new micro hydropower plants in the area.

*"Our strategy is to learn by doing and by adapting to the local situation"*

"Our short term goal was to construct these pilot plants through local companies, and to build capacities in the community to operate and manage them", says Bart Jan van Beuzekom from GIZ. "These goals have been reached. Now we will shift our focus to the further development and scale-up of the micro hydropower sector, using these plants as successful examples. Our strategy is to learn by doing and by adapting to the local situation. That takes time. But one day, the role of Energising Development will be over."



*EnDev constructed the main electricity grid in Gobecho village. Subscribers pay for the connecting wires.*

# Ethiopia: ample opportunities for renewable energy

Ethiopia has one of the lowest rates of energy consumption in the world. Only 14 percent of its 82 million inhabitants have access to electricity. In rural areas, where 85 percent of the Ethiopians live, less than one percent enjoys the benefits of a light bulb, socket or fridge. In the absence of clean and modern power sources, people still rely on traditional forms of energy, such as biomass -firewood, cow dung- and kerosene.

Not surprisingly, biomass is the country's primary energy source, with a share of over 92 percent of the total energy consumption. Biomass is mainly used for cooking. This has a negative impact on the environment and on the lives of women and girls. They spend on average six hours a week collecting firewood – time they could otherwise have spent studying or doing business. Moreover, daily inhalation of smoke causes health problems.

*A girl from Injibara bakes injera on a three-stone fire. With an improved cooking stove she could save half of the quantity of wood.*





# Boosting the energy sector

Energising Development has brought improved cooking stoves to more than 430.000 persons and dozens of institutions. The importance of building up markets for improved cooking stoves is one of the lessons learned.

Wondu Abegaz from the Ethiopian town of Injibara is a tall and lively man in a khaki uniform. His eyes sparkle, his hands are always busy, and his feet never rest. On his leafy compound, Wondu runs as many as four different businesses. One is a tree nursery. Another one is a bakery. A third one is a small shop at the side of the road. And the fourth one is a cooking stove workplace. Wondu sells Mirt stoves, concrete structures with a large round hot plate, suitable for baking injera, the Ethiopian staple food. The Mirt stove uses only half as much wood as the conventional stoves do. Together with his wife, he demonstrates how to make a Mirt. They quickly fill half-round iron moulds with cement and firmly tamp it. After ten minutes, six neatly shaped concrete elements are ready to dry and waiting to be sold and converted into a stove.

*"Five years ago, GIZ selected me to become a stove producer for this area"*

"Five years ago, GIZ selected me to become a stove producer for this area", Wondu says proudly. In his small office near the entrance of the plot he shows us his paperwork. Page after page, large cash books neatly record every client

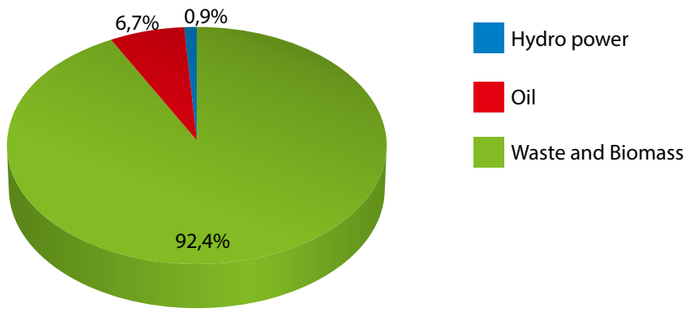
*Wondu Abegaz and his wife demonstrate how to make a fuel saving Mirt stove. Wondu was trained by EnDev to become a stove producer.*

# Ethiopia: ample opportunities for renewable energy

Only a tiny part of Ethiopia's energy consumption consists of electricity. Nearly all of it is produced in 14 large hydropower plants. In 2010, the country generated just under 4 terawatt-hour (TWh) of electricity for its 82 million people. In comparison: this roughly equals the energy consumption of the Dutch city of Amsterdam with 730,000 residents.

Ethiopia's low energy consumption and its dependency on biomass are in stark contrast to its opportunities for renewable energy. The sun shines most of the days, making Ethiopia a suitable place for the use of solar energy. Moreover, thousands of small rivers and waterfalls run from its mountains and hills, creating opportunities for micro hydropower. The annual potential for hydropower energy is estimated to be 162 TWh, which is 40 times the capacity exploited today. The potential for renewable energy is enormous. And this is what the Energising Development programme embarks on. With targeted interventions to enhance the use of renewable energy, Ethiopia's lagging position may turn into a leapfrog advantage.

Share of Ethiopia's Energy Supply 2008 (in%).
Source: Meder 2011, derived from IEA 2008.






# Boosting the energy sector

and every sale. "GIZ has trained me to do bookkeeping", he says. "I still use their forms." Wondu is one of the most successful Mirt stove producers in the area. Over the past five years, he has sold 2.400 stoves to households and small businesses.

Improved cooking stoves are a hot topic in Ethiopia and other parts of Africa. Millions of Africans cook on a three-stone open fire, which is dangerous, unhealthy, and bad for the environment. In the mountainous and woody north of Ethiopia trees are rapidly disappearing. This northern region is the centre of gravity for GIZ's 'biomass saving' energy-projects. Since the start of the project, 430,000 improved cooking stoves have been sold. Next to the Mirt stove, the project promotes the smaller metal tikikil stove, appropriate for boiling water and cooking rice, and the large institutional rocket stove for use in hospitals, schools and prisons.

*"We produce 70 to 100 liners a day"*

Most of the stove producers are individuals. Some of them are groups. Ten women from the small village of Kesa jointly own a pottery that produces clay liners for tikikil stoves. Their business started three years ago with the help of GIZ. Every weekday at 8 o'clock sharp they start their heavy job of collecting clay in the surrounding fields, pushing chumps of it into a large mould and pressing it neatly into clay tubes. "We produce 70 to 100 liners a day", says chairperson of the cooperative Tejittu Getachew. The liners are sold to metal workers who produce tikikil stoves. The profits are shared among the members. On average, the women earn 15 to 25 Euros a month. And even though this is not a large amount, it is an improvement. "We used to make clay pots at home", says Tejittu. "But we never knew when we could sell the next one. Now we have a fixed monthly income. We can educate our children and have peace of mind."

## Business driven approach

Since 2006, the cooking stove project has been part of the Energising Development initiative, implemented by GIZ and the Ethiopian government. In the GIZ-office in Bahir Dar, the largest town in North Ethiopia, regional manager Tewodros Berihun is one of the driving forces behind the programme. He has a round face, a gentle smile and a deliberate way of speaking. "Crucial to the success of the programme is a business driven approach", Tewodros says.

"We need to develop a self sustaining market for cooking stoves. Otherwise the programme will never be sustainable."
Over the past years, more than 530 local producers have been trained in 251 districts. A close partnership with the Ethiopian government has proved fundamental to accomplishing this goal. The immediate partners of GIZ are the woreda's, the government offices at a district level. The district Energy Office and Women's Office identify potential candidates for stove production. GIZ makes the final selection. "It is important that they have completed primary school and that they have a large enough workspace with access to water", says Tewodros. "We prefer candidates with some experience in doing business. Over 40 percent of them are women."
The candidates receive a short, but intensive training. Experts from GIZ and the government Energy Office teach them how to produce and install stoves. The government Bureau of Trade and Industry trains the basics of business management, bookkeeping, and pricing and promotion. Once producers have established themselves, GIZ supports their promotion activities. For example by printing brochures, distributing posters and broadcasting advertisements. Again, government is an important partner in this process. "Grassroots health workers are very supportive", says Tewodros. "They want an improved cooking stove in every house. When they visit a family, they persuade them to purchase one."

*Yemata Arage from Bahir Dar shows a Mirt stove that she has made.*
*The majority of the Mirt stove producers are women.*





### Dedication

The vast majority of the producers, such as Wondu, benefit considerably from the project. A sample study of 34 of them showed that 90 percent saw a significant increase in their income. Wondu Abegaz from Injibara goes door by door to attract new clients. Together with the government energy expert, he organises stove demonstrations on his compound. "We first show people the traditional way of cooking on an open fire", Wondu says. "Then we show them how to cook on an improved stove. The first time we organised a demonstration, we received 85 visitors. The second time we did it, 230 people came."

*"We first show people the traditional way of cooking on an open fire"*

Not every producer is as successful as Wondu. Most producers earn less than 2,000 birr (100 Euros) per year, and supplement their income with other activities. Moreover, not every producer has Wondu's sales talent. The women from the pottery in Kesa depend heavily on GIZ. "They need us to find clients", says regional manager Tewodros from GIZ. "Their customers are metal workers who produce tikikil stoves. These producers need clay liners, and the Kesa pottery provides very good quality. Nevertheless, the women just wait until we connect them to metal workers. We try to teach them business skills. We make them take responsibility for the purchase of new machines. We tell them that we will not always be there. But it is difficult. They live in a remote area. None of them can read or write. It is going to be a long way until they reach the stage where they are capable of finding market opportunities themselves."

### Reaching the poor and remote

Producers' marketing skills are crucial for the sustainability of the programme. Equally important is the presence of potential clients who have enough purchasing power. For the poorest families, however, a Mirt stove of 120 birr (6 Euros) is expensive. In Bahir Dar, Zerfe Belete still cooks her meals on a traditional three stone stove. A rickety wooden fence keeps her three cows away from the fireplace next to her house. Zerfe has surrounded the stones with a rim of mud in an attempt to keep the heat inside and save some wood. But the structure is not very firm. "I really want to buy a proper fuel saving stove", says Zerfe. "But I cannot afford it." Zerfe's husband is ill and completely depends on her. The couple is renting out two small houses, which provides

only little income. Zerfe spends about 20 birr (1 Euro) a week on firewood. In less than two months, she could recover the purchase costs of a Mirt stove. However, the cash to buy one is simply not there.

*"Many of the poorer households live in remote areas and they simply collect their own fuel"*

Tewodros of GIZ is well aware of this problem. "Today, the upper and middle class are using an improved cooking stove. And if they don't, it is probably just because they don't know where to buy one. The poorest households don't use them, because they cannot afford them." In 2005 and 2006, GIZ tried to overcome this obstacle by introducing a coupon-based subsidy system. The results were mixed. In the short term, the campaign drastically boosted sales. But after the coupons were dropped, sales dropped as well. The coupon system helped thousands of poor families to buy a stove, but it did not help the real market to grow and expand in a self-sustaining manner.

Distance also plays a role. Many of the poorer households live in remote areas and they simply collect their own fuel. That takes a lot of time, but doesn't cost anything. "When people collect their firewood for free, it is much harder to persuade them to buy an improved stove", says Tewodros." Practical constraints exacerbate, since most stove producers live in urban areas and the concrete Mirt stoves are heavy. Rural customers have to travel far to buy one and face transportation difficulties.

## Lower the threshold

The biomass programme has already proved a success in urban and semi-urban areas, where it has reached more than 430.000 households, institutions and small businesses such as restaurants. However, to reach more of the poorer and more remote households, new strategies could enhance markets. One of those strategies is the cooperation with microfinance institutions, which offer clients a loan to purchase a stove. Another strategy is to create village savings systems, by which members of a group put in small amounts of money on a regular basis, and take turns to use the contributions to buy a stove. Both strategies are currently being tested in various parts of Ethiopia. Some stove producers try to make things easier for their clients. In Injibara, Wondu Abegaz allows his customers to pay the cooking stove in two or three monthly instalments. "For many of them, this is helpful", Wondu says. "And my experience is that people rarely default."

To win over customers in remote areas, GIZ is currently testing a mud stove that was developed by local communities. It saves up to 43 percent of wood, and has a chimney to keep the smoke outside. Contrary to the Mirt, these stoves are constructed at the spot with local materials. With the help of GIZ, 70 farmers from different villages were recently trained to produce these stoves in their communities. The costs for the households could be limited to a small fee, in cash or kind, to the farmer-producer.

*"These stoves are constructed at the spot with local materials"*

More than 430.000 users and hundreds of producers are already benefiting from the programme. With the advancement of new financing strategies and production technologies, more poor and remote households will profit. "We are full of plans for the future", says Tewodros. "Our goal will be achieved once every Ethiopian home has a fuel saving cooking stove."

*A half-round iron mould is being filled with cement. Concrete is the base material of fuel saving Mirt stoves.*

# Monitoring impact

Each Energising Development project provides monitoring reports of the project's outcome on a regular basis. These reports indicate how many people are directly benefiting from access to modern energy. The latest reports from Ethiopia show that the programme had reached over 430,000 persons, almost 200 institutions and over 500 small businesses by the end of 2011. Households benefited from improved cooking stoves or electricity in their homes. Health centres had been electrified and stove producers and other small entrepreneurs saw their incomes improve.
Measuring outcomes is important in understanding the results of the programme. Over the course of the years, Energising Development has expanded the measurement of outcomes to include the measurement of impacts and sustainability. This leads to questions such as, How does access electricity change people's lives? And will these changes keep on?

Measuring impact requires a different approach, as compared with measuring outcomes. Impact monitoring makes changes visible. It is, however, quite difficult to tell which factor caused which change. Moreover, it is hardly possible to isolate the project's impact from other influences, such as political and economical factors and society's own internal mechanisms of development. Still, impact monitoring is important to identify the plausible contribution of the programme to the attainment of broader development goals.

In Ethiopia, an impact report of improved cook stove project provides evidence that the project had a positive impact on the income, health and biomass use of the consumers. The impacts of the electrification projects have not been evaluated in dept, because these projects are too new. Impact studies from other EnDev electrification projects show that they significantly contribute, among others, to improved incomes, health, education and the position of women.





# The Energising Development approach: lessons learned from Ethiopia

The Energising Development Programme in Ethiopia has gained a wealth of knowledge in increasing access to energy at grassroots level. Which lessons can be drawn from its experiences? This final article elaborates on the main features of EnDevs approach in Ethiopia, and briefly summarizes the key lessons learned and room for improvement.

### Market based approach

The Energising Development programme departs from a market based approach. Its objective is to develop local markets and build a sustainable renewable energy sector. The electrification programmes, for example, include the development of a local market for the construction and maintenance of micro hydropower plants, and the maintenance of solar panel installations. In December 2008, four Ethiopian contractors were trained in Indonesia. They are now capable of locally constructing turbines for micro hydropower plants.
The Ethiopian hydropower and solar panel installation industries are in an early growth stage. The cooking stove market has further expanded. By training and supporting hundreds of small scale producers, Energising Development has helped to create a local supply of cooking stoves.
However, two lessons can be drawn from this experience. For a short while, the

*Solar panels electrify the Sire Goyu Health Center. They provide electricity for the treatment rooms, laboratory, fridges and office.*

# Monitoring impact

Measuring sustainability is yet another challenge. A project is considered sustainable if its achievements continue in the long run. Based on experiences with the dissemination of efficient stoves, GIZ has developed a framework for assessing sustainability of cooking stove projects. A framework for assessing the sustainability of electrification projects is currently being tested. In the future, these methods will be used to measure the sustainability of the Ethiopian programme.

*A laboratory assistant uses an electronic microscope to examine blood samples. Without electricity it is difficult to make proper diagnoses.*



# Lessons learned from Ethiopia

cooking stove programme worked with a subsidy scheme for buyers. This greatly increased the demand, but sales dropped after the subsidy was removed. It had helped to boost the use and sales, but it had not helped to create a sustainable market. Therefore, Energising Development realises that it must embark on other strategies to improve sales and build markets.

*"A second lesson is the need to develop marketing skills"*

A second lesson is the need to develop marketing skills. Some producers, like Wondu Abegaz from Bahir Dar, are very talented and have greatly benefited from the training provided by EnDev. Others, however, have little capacity to promote their business and attract customers. An example is the women's pottery group in Kesa. Such producers may benefit from prolonged training and guidance.

### Cooperation with the Ethiopian government

Cooperation with the Ethiopian government, at local, regional and national level, has been crucial for the success of Energising Development. In the cooking stove project, for example, the regional government is involved in the selection and


*Posters in the streets of Bahir Dar alert people to the advantages of the Mirt stove. They support local stove producers with the marketing of their product.*

# Saving the environment

Poverty reduction in Ethiopia will not materialize without a significant increase of energy use. However, higher energy consumption is controversial. The use of traditional biomass already puts an enormous strain on Ethiopia's natural resources, and burning fossil fuels contributes to climate change. Therefore, the objective of Energising Development Ethiopia is to provide energy to households, to benefit the local environment and to have minimum impact on the global environment.

*Villagers sell wood at the local market in Injibara. The rural population chops more than 150 thousand hectares of trees every year.*





training of producers. Moreover, government health workers and energy experts help to raise awareness among households. The solar panel programme, which has electrified over a hundred health centres, has also been implemented in close conjunction with the government. Responsible regional government officials have been trained, together with staff member from the clinics, to maintain and operate the solar installation system. This has increased knowledge of solar systems and a sense of ownership at government level. The sustainability of the programme greatly depends on the involvement and commitment of the Ethiopian government in the long term. In the case of the micro hydropower plants and solar panel installations, government has to reserve sufficient funds for replacement over time. Moreover, government has to push a further expansion of the renewable energy market, by investing in renewable energy for schools, hospitals and other social institutions. Both the micro hydropower and solar installation programme are pilot projects, and it is therefore too early to draw conclusions. Government commitment, however, appears to be high. For example, the ministry of health has used the health centre pilot project as an example to electrify 500 smaller health posts with solar installation panels. Over the next years, it plans to electrify another 1500.

### Reaching low income groups

Most energising development projects tend to benefit the higher income groups first. The cooperatives of the hydropower plants, for example, notice that commercial farmers are the first ones to register for an electricity connection. Likewise, evaluations of the cooking stove project show the medium and higher income groups are the first ones to buy an improved cooking stove. The poorer and more remote households are particularly hampered by the relatively high investment costs.

*"Commercial farmers are the first ones to register"*

However, the poorer households benefit as well in some ways. This is especially true for the electrification of rural health centres. Patients report improved care and better service after their health centre had been electrified. Likewise, people living near a micro hydropower plant benefit from the illuminated streets, library, shops and restaurants in their village, even if they don't have a light bulb in their house.

# Saving the environment

The core of the Energising Development (EnDev) programme consists of two components: reducing the use of biomass, and increasing the production of renewable energy. In Ethiopia, biomass is widely used for cooking and people do this beyond sustainable yield. The extraction of firewood for cooking is an important source of deforestation. The rural population chops more than 150 thousand hectares of trees every year and uses it as firewood. Today, less than four percent of the once abundantly forested country is covered with trees. EnDev concentrates on the introduction of fuel efficient cooking stoves.

In addition to biomass, electricity is an important source of energy. Large hydropower stations currently provide 88 percent of Ethiopia's power. However, they are associated with a number of negative environmental effects. Large hydropower stations influence the quality of water, soils and biodiversity throughout the river basin. Furthermore, the construction of large dams can influence the water quantity in downstream areas, affecting long-established farming practises.

Energising Development promotes two ways of generating electricity in an environmentally friendly way. Micro hydropower schemes, firstly, have a smaller impact on the environment than large hydropower plants.  No big dam or water reservoir is needed, and the effects on downstream areas are therefore limited.  The EnDev programme currently pilots four micro hydropower plants. In addition, EnDev promotes the use of solar energy in remote health centres. In general, using solar energy has a negative impact on the environment at the beginning stage, because of the production and the transportation of the equipment. After a few years that impact is balanced out by the positive features of generating electricity from the sun. The solar installations in the EnDev programme are designed to function for at least twenty years, ensuring a positive long term influence on the environment.



# Lessons learned from Ethiopia

Nevertheless, reaching lower income groups is essential. Firstly, it is important to attain the programme's overall goal of alleviating poverty. Secondly, including the poorest households is necessary to drive demand and create a widely available supply of cheap and high quality energy products and services.
The lesson learned is that additional strategies and instruments are needed to attract the poor. For example, the hydropower cooperative in Gobecho intends to cooperate with microfinance institutions to offer loans and invest in small scale businesses in the village. This could increase incomes of the poorest households and help them to pay for the connection. Likewise, the cooking stove programme is testing new designs that are cheaper and better suited to rural households. It is also experimenting with savings and credit instruments, to overcome the hurdle of the initial investment in an improved cooking stove.

*Fekirte Guje of Gobecho runs a tea house together with her husband.*
*They deliberately moved to the electricity grid to start a business.*

*The Kesa women's pottery produces clay liners for metal cooking stoves.*
*The women use their income to educate their children.*

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# Energising communities in Ethiopia

endev

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