



# Empowering People

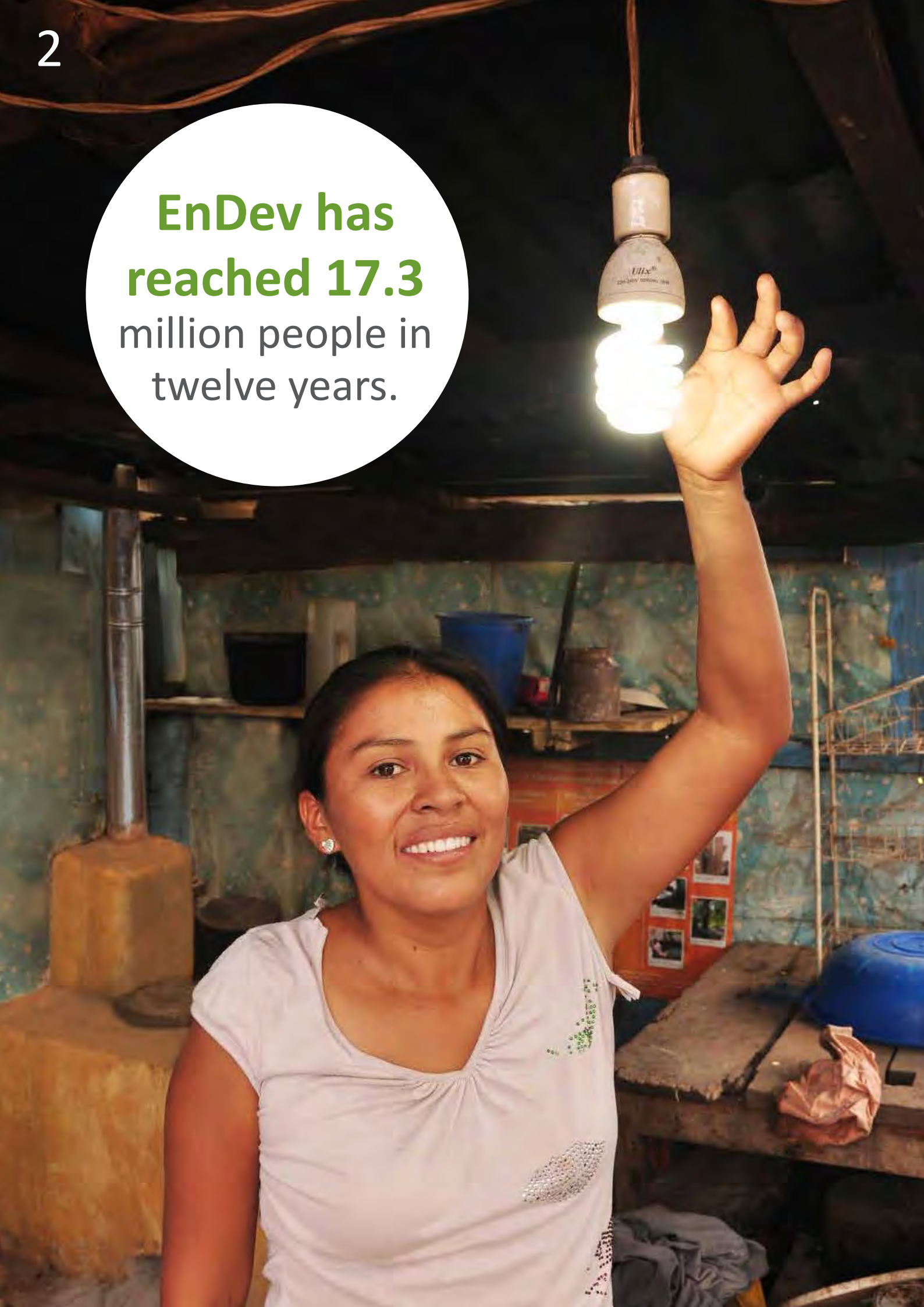
Report on Impacts



*energising  
development*



**EnDev has  
reached 17.3**  
million people in  
twelve years.



# Empowering People

Four out of five people on this planet simply turn a switch. The lights come on, a computer powers up, hot water flows from a tap or machines start humming.

One out of five, however, does not have a switch to turn, since he or she simply has no access to modern energy with detrimental impact on the livelihood and well-being. There are various reasons why 1 billion people are still without electricity and 3 billion rely on open fires and traditional stoves for cooking. Operating electricity grids in remote areas is not economically viable for many electricity suppliers in developing and emerging countries and markets for off-grid technologies are not yet developed. Initiatives for promoting modern cookstoves, in turn, face numerous social, cultural and economic challenges.

Energising Development – EnDev – supports access to energy services for all. EnDev focuses on practical solutions for the poor in underdeveloped regions. Access to energy for this particular target group is an essential element for improving their livelihoods and to reduce inequalities. EnDev's work is rooted in concrete implementation in the field: the bottom-up development of sustainable markets and sectors for pro-poor energy access, and bringing them to scale. EnDev achieves results in terms of sustainable energy access for households, SMEs and social institutions like rural schools and health centres, and in terms of positive impacts on poverty alleviation, gender equality, health, climate, employment, and inclusive economic development.

A pro-poor market approach has the advantage that it supports the self-interest of the suppliers and customers at the same time. Manufacturers and retailers are inspired to develop and sell products and services that meet the basic needs of low-income households and are affordable. Smart subsidies may support penetration into remote areas and to reach more people. Once the markets are up and running, EnDev slowly withdraws and uses its experiences to initiate markets in more countries.

EnDev has facilitated sustainable access to energy to 17.3 million people since 2005. This number is equal to the entire population of the Netherlands. It was not a straight forward path. What worked in one country didn't work in another. Trying, failing, readjusting, and succeeding: As a learning programme, EnDev has fine-tuned its methods over the years and has gathered knowledge shared globally with other actors in this field of development.

The Sustainable Development Goal 7 to achieve universal access to affordable, reliable, sustainable and modern energy for all while mitigating greenhouse gas emissions at the same time represents a great challenge EnDev and its partners are committed to. Policies, technology, finance and strategies exist – and yet the mission is still far from being accomplished.



# Executive Summary

Between September 2005 and December 2016 EnDev facilitated access to sustainable energy services for 17.3 million people. EnDev is mainly active in Africa but is also engaged in Asia and Latin America. On average, EnDev does not spend more than EUR 20 per capita, which is very cost effective in comparison to other programmes. The multinational development partnership has successfully launched markets for modern cookstoves, solar lighting systems and mini-hydro plants in its partner countries. It promotes the expansion of the electricity grid as well as isolated solutions in remote regions. In areas with electricity grids, EnDev develops concepts to enable people in the proximity to afford a connection.

## Which impact has EnDev achieved?

Access to energy is a tool to improve livelihoods. The dissemination of modern energy devices can improve living conditions for people. Energy access figures are relatively easy to gather. It is much harder, however, to quantify and qualify impacts on productivity, poverty, health, gender, education as well as on environment & climate. EnDev has therefore commissioned a large number of studies. These studies underpin the positive impact of the EnDev programme.

**Reduced Poverty & Productive Use:** In cooperation with its partners, EnDev has enabled 17.3 million people, 19,400 social institutions and 38,600 small and medium-sized enterprises to gain access to modern energy. EnDev has also trained more than 40,000 stove builders, craftsmen, vendors, operators and technicians. Stove builders and solar companies being supported by EnDev achieved average yearly revenues of over EUR 25.7 million.

**Gender:** Electricity and modern cookstoves facilitate the work of women and girls. Electric lighting improves living and working conditions at home, while modern stoves cook faster and cleaner, use less firewood and save up to 40 per cent of the time usually spent on firewood collection. Women benefit from job creation, too, as shown by a study in Kenya, where women account for almost half of all modern stove builders, installers and marketers.

**Health:** Modern stoves and lighting systems reduce emissions caused by traditional stoves or three-stone fires and by kerosene lamps and candles. Almost half (46%) of improved cookstoves disseminated by EnDev are categorised as tier 2 and higher based on the Global Tracking Framework by SEforALL\*. This implies a 'sufficient' level of health protection for the users. The stoves promoted by EnDev emit on average 30 to 40 per cent less carbon monoxide and other pollutants such as nitrogen oxides, benzene or formaldehyde than the baseline stoves traditionally used.

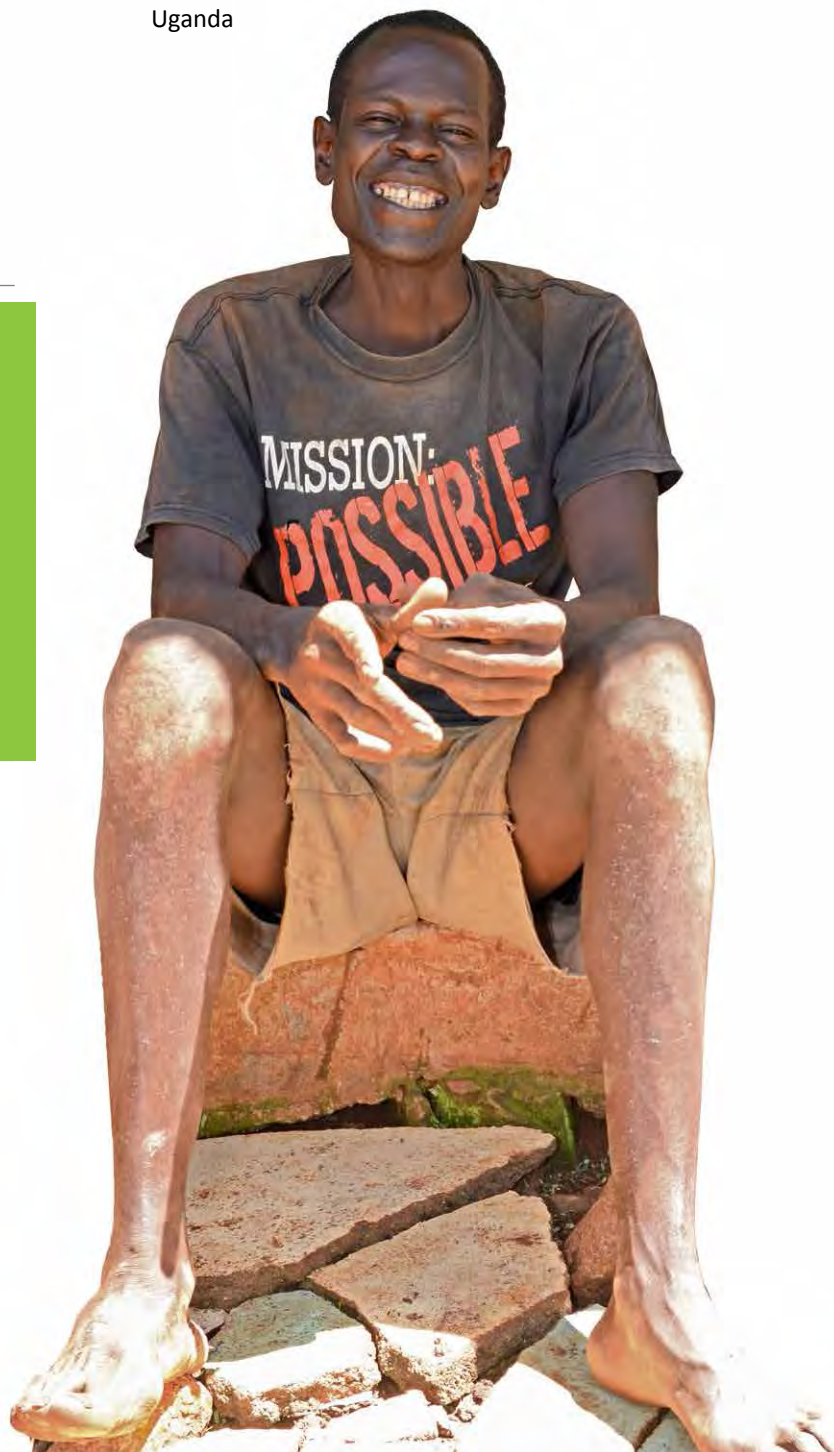
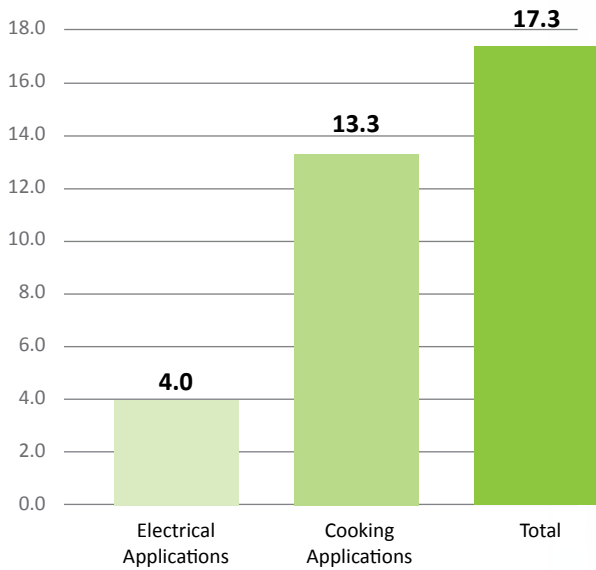
**Education:** To date, EnDev and its partners have supported more than 13,400 schools to gain access to modern energy services. It is expected that this will lead to better learning and higher success rates.

**Environment & Climate:** Today, at a conservative estimate, more than 3 million stoves improve the lives of 13.3 million people; 4 million people benefit from modern lighting through EnDev interventions. Promoted improved cookstoves save about 1.8 million tons of CO<sub>2</sub> equivalent each year compared to traditional 3-stone fires, because every stove saves on average 0.54 tonnes of CO<sub>2</sub> equivalent per year. The wood and charcoal stoves supported by EnDev save up to 1.7 million tons of firewood each year which contributes to reducing the degradation of forests. Although one cannot assume that this entire forest area will remain, it is clear - and has been confirmed by several studies - that the pressure on forests is lowered.





**Number of households who gained access to modern energy services since 2005**



\* The tier system for improved cookstoves is work in progress internationally. Applying the current methodology as laid down in the mid-2016 version of the Global Tracking Framework, the EnDev outcomes of the second programme phase could be attributed to the five tiers as stated above. The tier system ranges from tier 0 to tier 5. Tier 0 implies a highly deficient access to needed quantity of energy source, a very low level of health protection and very low convenience whereas tier 5 means very good access to needed quantity of energy source, a very high level of health protection and very high convenience.

## Energy, Development & EnDev

By creating dynamic markets for sustainable energy technologies, one can reach people who presently have no access to electricity.

Velma Achieng lives in a small village north of Kisumu, a Kenyan city close to Lake Victoria. Like her mother and grandmothers, she cooks with firewood which she has to collect. While she is breaking and stacking branches, her mobile phone keeps ringing. She uses it to make phone calls but also to receive money and pay bills.

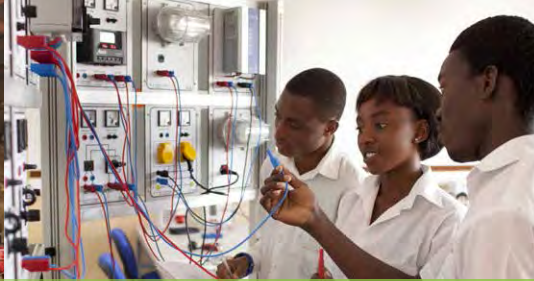
Banking services via mobile phone in direct conjunction with the thousand-year old technique of a three-stone-fire. This seeming incongruence has become part of every-day life in many EnDev partner countries. Today, energy can be produced in many ways and used for numerous applications. Which form of energy actually makes sense and which path of development people take, depends on the particular requirements of people and their financial circumstances. It is also determined by the geographic, climatic and cultural conditions under which people live. Energy is not necessarily the most important challenge for people without access to it. Clean water, food, schools, higher income or an internet connection – citizens of developing countries have many unmet needs. Many of these needs can be addressed much more easily, though, with access to modern energy.

Energy is an important tool for reaching the Sustainable Development Goals. An increasing number of international organisations today emphasise the significance of energy. Thus the United Nations founded the global Sustainable Energy for All Initiative, with the goal to provide modern energy to everyone by 2030. The EU Commission has joined the initiative and wants to provide 500 million people with access to energy by this time.

In cooperation with a wide range of local partners, EnDev has gathered much experience regarding ways and means to achieve energy access for all people. Energy demand and supply varies from country to country and region to region. The challenges are very similar though: EnDev and its partners have to investigate local requirements and options, adapt technologies, train engineers, technicians and managers and develop financing instruments.

To reach its goals, EnDev creates functioning pro poor energy markets. Only markets fulfilling all requirements and needs will work sustainably.





# People improving their lives



PERU: Lucerito Julián Castrejón from Soritor, runs her own company offering improved cookstoves and solar lamps. She sells about fifty stoves per month, earning an average of 10,000 Soles (USD 2,940) which she uses mainly for the education of her four children.

◀ BENIN: "I am running a welding shop and training young apprentices. Since we have electricity my business is developing more and more," says Salomon Kotchoni.



ETHIOPIA: Nurse Salamawit enjoys light in the waiting room. Just like in other electrified health centres, staff turnover has dropped significantly in Sire Goyu.



◀ SENEGAL: Ali Diouf from the Senegalese village of Sine Moussa Abdou is connected to a mini-grid delivering energy to 69 households, two schools, a health post and a mosque. Ali Diouf pays for the energy in advance using a prepaid card. EnDev supported the mini-grid project in a private public partnership with the Senegalese-German electric utility provider Inensus who manages the grid.



◀ NEPAL: "We no longer have to stay in smoky homes, thus stay healthy. Also, we use less firewood now and this is helping to save our forest," says Purna Bahadur Rai from Jalpa VDC.

ETHIOPIA: "Since we are connected we are now able to sterilize our equipment and run microscopes to diagnose Malaria," explains David Tersasa, who runs Sire Goyu health centre.





## What makes EnDev unique

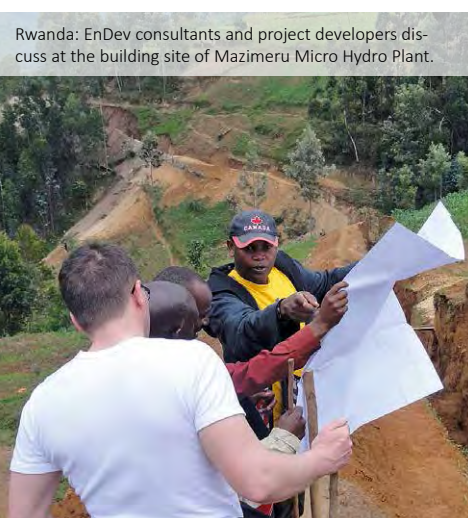
EnDev has reached more than 17 million people. The partnership has achieved this number with a minimum of means and by mobilising various public and private investors. Many factors contribute to these successes, a few stand out.

### Initiate sustainable energy markets

Market dynamics are created where needs are met and where suppliers can earn an income from meeting these needs. In order to create such an environment, EnDev works on community, regional, national and international levels. EnDev intervenes both on the supply and the demand side and is committed to improving the general framework. The development of self-sustained markets, however, is only possible with strong local partners. Therefore, EnDev cooperates with government institutions as well as with NGOs, universities, financial institutions and private sector companies. Depending on the existing market structures, or the lack thereof, the time to work out how to stimulate the market effectively can vary greatly among the country projects.

For instance, in Kenya the development of a market for high quality off-grid solar products took just two years since the initial demand was high, other market actors invested quickly too and the general framework was beneficial. In other countries, the process takes much longer as the demand is lower and the necessary structures are not in place.

Together with its partners, EnDev targets innovation by adapting technologies, which ideally can then be fully maintained in the respective countries and, where possible, also produced locally. To enable efficient manufacturing, operation and distribution of the products, EnDev has, for example, initiated training courses for hydropower operators, biogas digester builders, grid technicians, stove builders and solar technicians, and also provided coaching for future entrepreneurs in marketing and business skills. Many producers as well as customers are not aware that there are appropriate, robust and inexpensive technologies to meet their requirements. Therefore, EnDev initiates information and marketing campaigns.





## EnDev supports grid extension and connecting people

Triggering market development, however, is only one of many interventions. EnDev also focuses on grid extension and mini-grids, and provides its partners with information and know-how. An example of an efficient strategy is to connect people who live close to grids but cannot afford the one-off connection fee.

Another field of intervention is the development of financing concepts in cooperation with branch organisations, banks and government agencies which enable communities for example in Nepal to electrify their villages. In countries such as Bolivia, EnDev, in cooperation with energy providers, introduced credit schemes for people with low incomes. Thus, people can finance the high connection cost and pay back the credit step by step as they spend less money for candles, kerosene or batteries.

Poor-quality technologies endanger emerging markets. Therefore, EnDev commissions comparative studies and advocates high quality standards. For this reason, EnDev is also active in international initiatives, such as Lighting Africa and the Global Alliance for Clean Cookstoves.

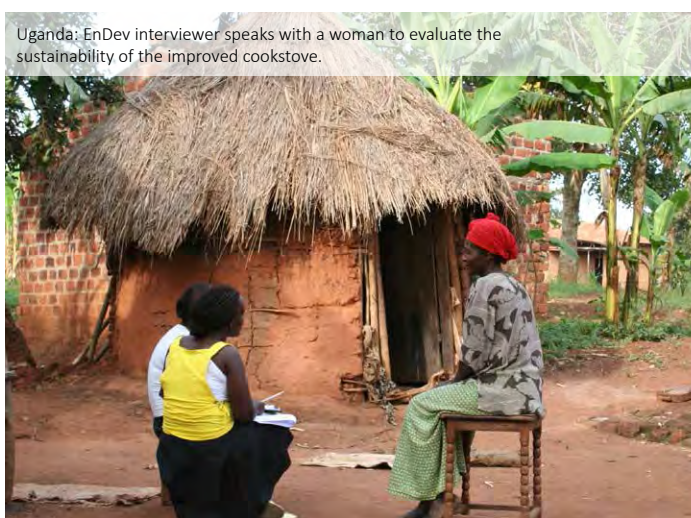
## Courage to fail – internal competition of methods

New technologies and strategies are not necessarily always successful. Conceding failure is part of the EnDev philosophy, and by learning, future larger failures are avoided. For this reason, EnDev creates an internal competition for the best methods and strategies. Projects with good results consequently receive more funds. In addition, EnDev adapts successful strategies in partner countries, thereby reaching a large number of people in a short time and at low cost.

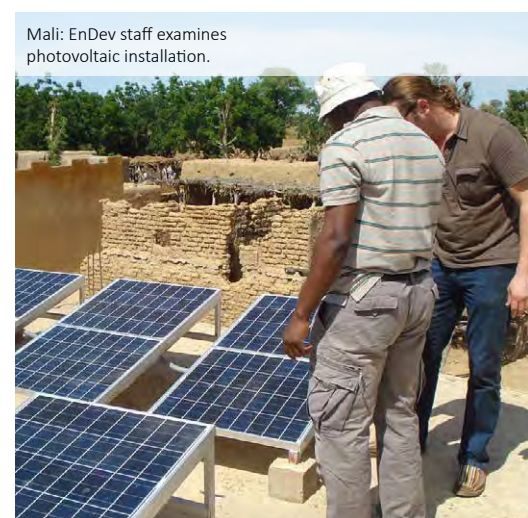
## Methodical monitoring – the figures add up

Another unique feature of EnDev is methodical monitoring. Each project has to report outcome figures every six months. How many stoves were sold? How many companies and schools were electrified? The numbers are checked for plausibility and validity. EnDev gathers the figures based on standardised approaches and deliberately uses conservative calculations.

The figures are generously adjusted downwards to account for several aspects, such as free-rider effects (people who would have gained access anyway) or to prevent double counting of beneficiaries with access to both energy for cooking and electricity. A sustainable adjustment factor, for example, takes into consideration that the access provided to modern energy technologies might not be sustainable in all cases.



Uganda: EnDev interviewer speaks with a woman to evaluate the sustainability of the improved cookstove.



Mali: EnDev staff examines photovoltaic installation.





Energy markets increase  
productivity and create jobs



More than 11,000 people have found new employment and income in one of the energy markets initiated by EnDev. Moreover, energy creates the opportunity for people to improve their income independently.

Twenty per cent of the world's population have to survive on less than USD 1.25 a day. The Sustainable Development Goals aim at ending this extreme poverty until 2030. Access to modern energy services will be a necessary condition to reach this goal.

Thus, EnDev supports the Sustainable Development Goals in creating markets for energy services to supply people, institutions and small and medium-sized enterprises. With modern energy services, people can improve their livelihoods and save money. Moreover, modern energy is a tool to create jobs and business opportunities. Finally, energy services can improve productive processes in agriculture as well as in manufacturing and services. The Centre for Global Development confirms the importance of energy in its Africa's Private Sector report: "There is perhaps no greater burden on African firms than the lack of reliable supply of electric power."

### Efficient cooking and lighting saves money

People with low income use energy mainly for cooking purposes and lighting. With modern stoves, they can save up to 40 per cent of fuel costs and spend this money for other important things. Households save between EUR 4 per month in Uganda and up to EUR 6 per week in Peru. In Rwanda, households using biogas digesters save as much as EUR 70 or 30 per cent of their fuel costs each year. However, investment costs are high and it takes up to 10 years until they are written off by the savings.

Where they collect firewood instead of paying for it, people save time. In Kenya, time saved can reach up to twelve days a month. According to an impact study, half of the respondents use the saved time for productive activities.

### Training creates jobs

Massaër Guéye is an ambitious national stove entrepreneur who started as local tinsmith with one apprentice. In 2010, he was trained to produce improved cookstoves while, in 2013, he received further training by EnDev so that he could modernise his production facilities. "I also learnt how to produce the new charcoal stove Éclair. Thanks to these innovations, my production has now reached up to 3,500 stoves a month. I employ 22 people that earn between EUR 3 and EUR 6 per day each. I sell my stoves in all regions of Senegal through my own distribution network", he says.

The Senegalese is one of approximately 40,000 people who were trained in one of the EnDev workshops initiated in partner countries. EnDev supports the training of vendors for biogas appliances and cookstoves in Peru and Bangladesh, operators of hydropower plants in Indonesia, engineers for grid extension in Nepal and sales people for solar lanterns in Kenya and Burundi. The aim of the trainings is to create markets for energy services by teaching participants about producing, installing or selling energy products. Thus, EnDev relies not only on technical capabilities, but also teaches business skills. Moreover, EnDev partners provide marketing campaigns and financing tools to initiate these markets.

Many of the people trained run their company as a family business; others have formed businesses or cooperatives. Combining technical and management capabilities has proved

successful. In a study in Kenya half of the interviewed stove vendors confirmed that their income has increased by 55 per cent. For two out of three stove vendors, the stove business has become their main income source. Many of them had to rely on a single source of income (mainly agriculture) in the past. Now their income sources are more diversified, making their economic situation more stable. 65 per cent of the stove entrepreneurs trained others to become stove vendors. 87 per cent of the respondents stated that they invested in their business and almost all of them hired one or two people. Another example of EnDev's commitment is the support of Ethiopian businesses which currently develop an African production of hydro turbines and small hydropower plants.

The newly established energy companies, service providers and professional stove builders supply consumers with clean, affordable energy. Since 2015 EnDev measures also leverage effects. The total value of all stoves and off-grid systems sold or installed by companies cooperating closely with EnDev since 2015 was EUR 123 million, which is twice as much as the total EnDev programme expenditures during the same period.

## Energy opens opportunities for productive use

Access to modern energy opens job opportunities. Electric lighting allows shops to stay open during the night. A simple light on a market stall or a television in a restaurant in rural Mali draws new customers. In Mozambique, EnDev supported grid extension to people with low incomes. 14 per cent of the households purchased a refrigerator; every tenth new fridge owner subsequently opened a business, selling chicken, cold drinks and ice cubes. Agnes Segla from Toucountouna in Northwestern Benin opened a grocery store in 2009 when her village was electrified. Now she sells fish, frozen food, sausages and delivers her products to restaurants too.

In Rwanda, interviewed owners of electrified small and medium-sized enterprises stated that they work faster and more efficiently now that they have electricity. Every third owner has expanded into new activities, for example welding, battery charging, running a bar or a barber shop.

An EnDev study concluded, however, that a lot of business owners lack the ideas and knowledge required to create new activities. This is why a new electrical connection is no guarantee that businesses and jobs will be created. In Ghana, EnDev supported the creation of industrial zones with improved energy supply but has also included business and environmental management training in its service package. With new access to energy, 44 per cent of small and medium-sized enterprises invested in new machines such as electric welding machines, drilling and filing machines. An EnDev impact study showed that these investing enterprises earn around eleven per cent more than non-investing companies. According to an impact study, electrified enterprises in the Indonesian province Sulawesi reported an increase in their profits of between 20 and 33 per cent.

Furthermore, productive use of modern energy is a source of savings. Fish restaurant owners in a Kenyan city, Kisumu, are cooking with improved cookstoves. Joyce Apondi Okelo - for example - spends less money on firewood and therefore has more to spend on other things. "I save about 600 Kenyan Shillings every day," which is a lot in a country where many people hardly earn 200 Kenyan Shillings, less than EUR 2 per day.

## Energy improves food production and processing

In rural areas, agriculture and food processing plays a very important role as it is the only source of income for many people. Energy technologies can ease the workload and make production processes more efficient. And they reduce food waste.

Solar water pumps, for example, can improve irrigation. Solar dryers help to process peanuts in Bolivia, coffee in Peru or Nicaragua, cocoa in Liberia. In Peru, EnDev has enabled the installation of solar coffee and cocoa bean dryers. Interviews with the respective heads of associations have found that members' earnings have increased by at least ten per cent since installing the new technologies.









Women benefit from cleaner stoves and modern lighting



## Modern stoves reduce the burden of collecting biomass for cooking

Women and children often spend several hours a day gathering fuel wood or other biomass for cooking. They carry weights of 50 kg for several kilometres. During the collection time they are exposed to health risks such as back and foot damage, wounds, cuts, fractures, chronic headache and exposure to extreme weather. They are also exposed to animal attacks and especially women and girls to physical and psychological violence including rape. Collecting firewood is a very strenuous and time-consuming task that can lead to lack of time for other purposes such as school attendance and studying.

## Access to electricity eases agricultural work

Women especially profit from the dissemination of productive energy technologies in agriculture. According to the FAO, women comprise just over 40 per cent of the agricultural labour force in the developing world. In Africa and Southeast Asia, they do almost half of the work. Although it is a rather small effect, machines replacing manual labour in farming markedly ease the burden on women. According to EnDev studies, 90 per cent of women interviewed in Pancung Taba in Indonesia reduced time spent on their agricultural activities by using electrical appliances for rasping coconuts or chopping chillis instead of doing this work manually.

## Lighting improves living conditions

In lighting up their streets, community spaces become more secure for women. 88 per cent of solar home system users in Bangladesh confirm that electric lighting in households improved their working comfort. Most women highly appreciate being able to distribute their household chores more freely throughout the day. Electricity does not ease the burden on women everywhere though. A study in Uganda, for instance, showed that in parts of the country without electricity 14 per cent of men in households lend their woman a hand at work, whereas in households equipped with SHS only seven per cent do so.

There is no doubt that efficient cookstoves create an overwhelmingly positive impact. Due to the dissemination of modern cookstoves, EnDev and its partners have reduced the exposure of smoke and thus reduced the health risks of at least five million women and children.

## Women produce, install and sell stoves and create their own income

Wherever EnDev initiated markets for modern cookstoves and solar systems, new income sources have developed, both for women and men. In Kenya for example, EnDev has trained more than 3,700 stove producers, installers and marketers. According to a study in Kenya, women account for 53 per cent of the producers, 48 per cent of the installers, and 42 per cent of the marketers. However, the gender balance in newly created jobs depends on the specific technology and tasks. Whitesmiths as well as other metal-workers are mainly men, whereas pottery is dominated by women. The gender composition among retailers is roughly balanced, with a stronger representation of men in electric sales shops and a stronger representation of women in village shops. Hawkers which travel around and visit households are more often men, as travelling and even over-night stays is a particular problem for women for security reasons and because husbands might not allow such travels.

The income of men and women often differ. The Kenya study showed, that 7.5 per cent of men earn more than EUR 270 per month, whereas only three per cent of the women earn that much. Conversely, half of the women earn less than EUR 45 per month, whereas only 28 per cent of men belong to this lowest income group. However, men usually work longer hours in their businesses while women instead are often occupied with household activities that do not create income. However, especially in rural areas, building and selling stoves provides women with their own source of income and a possibility of more independence.

## Modern energy – a key to health and health services

Modern cookstoves and lighting devices reduce exposure to smoke and soot. Access to electricity enhances the quality of health services and thus improves diagnosis and treatment of diseases as well as prevention, maternity and child care measures.

Jane Ambuka cooks the meals in Mungoye primary school, Kenya. Five smoky fires are burning under big pots in a small hut. One can hardly see anything in the thick smoke. “My eyes are burning every day and I am coughing a lot, because my breast hurts,” Jane Ambuka says.

### Health

More than 3 billion people cook their meals like Jane Ambuka with polluting cooking technologies. The exposure to household air pollution causes 4.3 million premature deaths each year, making it the single most important environmental health risk factor worldwide, according to the WHO. Cooking with polluting technologies is thus responsible for more deaths than malaria.

Especially women and children are affected by smoke and soot as they spend more time near the cooking fires compared to men. Already unborn children suffer if pregnant women are cooking and exposed to cooking pollutants. The birthweight is generally lower and lung functions weaker. Development and growth of lungs are reduced if young children continue to be exposed to smoke and soot during their childhood. Exposure to household air pollution is responsible for more than half of deaths to childhood pneumonia in children under five years of age.

Improved cookstoves with low emissions and ideally with chimney protect children and women especially, since they produce less smoke or none at all. Where they replace open fires, they also reduce the risks of severe burns. It is therefore a central objective of EnDev to disseminate modern cooking systems consisting of high quality fuels, low emission stoves, good kitchen ventilation and





consumer education. Stove builders that were professionally trained by EnDev sold more than 9 million modern stoves by the end of 2016. Due to their construction, these stoves emit 30 to 40 per cent less carbon monoxide and other pollutants such as nitrogen oxide, benzene and formaldehyde.

About half of them have a positive impact on health, as their emissions are low and/or they are used in combination with a chimney or high ventilation. According to a study in Peru, 70.5 per cent of traditional stove users complain of coughing attacks and 65.2 per cent about eye infections. Among the users of improved modern stoves with chimney, only 6.1 per cent and 3.3 per cent respectively are affected. Kerosene lamps also emit carbon monoxide and dioxide, further pollutants. They also cause accidents and burns. In Bangladesh, three out of ten interviewees reported fires and burns through the use of kerosene lamps. Since changing their lighting to SHS, kerosene accidents have only been reported by 3.8 per cent of the respondents.

EnDev focuses on electrical systems that are either fed through the electrical supply system via a grid or mini-grid connection or with the help of stand-alone solutions. The engagement of EnDev has contributed to an additional four million people being able to light their houses in a healthy manner.

## Health Services

Energy is a prerequisite for improving health care. Nevertheless, more than one billion people have to undergo treatment in health facilities without electricity. In order to improve the care of patients, EnDev has already supplied 19,387 social facilities, among them 1,200 health facilities. The Sire Goyu Health Centre is one of 350 stations in Ethiopia that now have sufficient electricity at their disposal.

Salamawit Betru, a local nurse appreciates the difference: "Pregnant women came often by night. We had to light the room with candles and kerosene lamps. We even used our mobile phone as a torch." Today, electric bulbs light up the treatment room. Due to the energy access, Salamawit is able to refrigerate vaccines, sterilise instruments and to test patients for malaria.

Health centres with SHS can reliably run microscopes, sterilisers and refrigerators. They can illuminate their buildings and use VHF radios or mobile phones to consult medical specialists when required.





Education is the best investment in the future





## Light, electricity, food, heating: modern energy services facilitate learning – in schools and at home.

According to the 2013 Poor People's Energy Outlook, children who go to school for twelve instead of just six years earn 1.6 times as much as the comparison group. A good education depends on many factors – class size, available training material, motivation of teachers, as well as food supply for the students. Many of these factors, in one way or another, depend on access to energy. It is estimated that about every second student in developing countries – about 291 million children – attend schools without electricity. EnDev is therefore focused on providing schools with access to modern energy services. To date, the programme has supported more than 13,400 schools with various forms of energy services.

The provision of lighting systems to schools through EnDev partners enables most of the schools to run additional classes at night. Schools with access to the grid can also run computers, copy machines, projectors and printers. This helps school management to organise its administration more efficiently. Teachers, in turn, will be more likely to be willing to teach in remote regions.

Efficient and smoke-free cookstoves reduce the costs for the daily school meals. One example: After investing EUR 1,600 in three institutional rocket stoves, the primary school in Nyamninia in Kenya saved 70 per cent on firewood spending, money which can be spent on learning materials, nutrition or wages for teachers.

In cold regions, EnDev ensures that schools have access to hot showers or heating. In Peru, EnDev supports the installation of solar water heaters. Since their school was connected to a hydropower station, the students in Phugmoche in the Nepalese Solukhumbu district are taught in heated rooms and can take warm showers.

### Better lighting – better learning conditions

Learning conditions are improved in different ways through access to modern energy both in schools and in households. With adequate lighting students can study more comfortably and even more hours. In Bangladesh, 40 per cent of SHS users stated that one of the main reasons for purchasing a solar system was to improve study conditions.

People living in electrified households in Bangladesh on average read twelve per cent more than people without electricity. An impact study shows that students in Ethiopia are highly motivated to do their homework. They spend a large part of their free time studying. Moreover, access to energy allows students to get information from TV and radio, the only source of information in rural Indonesia, where no newspapers are available.

## More energy, less emissions

### Sustainable access to energy minimises greenhouse gas emissions and contributes to the Paris Climate Agreement.

In Burkina Faso brewing beer is the woman's task. "It takes ten days to brew our Dolo beer from millet, water and yeast," explains Evelyne Compaoré while she stirs the mix and keeps the fire going. The resolute woman operates one of the 2,380 smallholder breweries in Ouagadougou. Together, the breweries consume half of the capital's firewood demand. With her new stove Evelyne Compaoré saves 40 per cent of woodfuel. It was constructed by a professional stove builder. EnDev organised his training and over time trained 285 other stove builders. The new stove will have paid for itself after only three to four brewings. Due to lower firewood consumption not only Evelyne but also the environment benefits.

The builders trained by EnDev have produced and sold more than 9 million stoves worldwide. Each stove saves between 30 and 60 per cent of firewood or charcoal. However, people with a new stove still use their old stove infrequently. EnDev takes this fact into account when calculating the firewood consumption and CO<sub>2</sub> emission savings. Moreover, it always applies the lowest possible saving per stove for the calculation, i.e. 30 per cent fuel saving.

Thus, the modern stoves distributed within the framework of EnDev projects are already saving more than 1,690,000 tons of firewood every year. Moreover, every stove saves up to 0.54 tons CO<sub>2</sub> equivalent per stove per year. This accumulates to savings of 1,705,000 tons of CO<sub>2</sub> equivalent every year.

In addition, the LED and incandescent bulbs installed by EnDev partners also reduce CO<sub>2</sub> emissions. Based on laboratory and field data from EnDev monitoring, savings of about 70 kg per lamp can be assumed. EnDev calculations show that the four million people supplied will save another 134,000 tons of CO<sub>2</sub> equivalent.

The entire CO<sub>2</sub> reduction of modern cookstoves and efficient lighting thus amounts to over 1.8 million tons per year. This corresponds to the emissions of 1,138,000 cars assuming they are used for 10,000 kilometres a year. In short, cookstoves - even simple ones - are an important and often neglected part of a CO<sub>2</sub> mitigation strategy.

In contrast, it is much harder to draw conclusions on the positive impact of improved stoves concerning the degree of reduced deforestation. Forests are under pressure for various reasons. While it cannot currently be ascertained that improved cookstoves preserve forest cover, they surely reduce demand for biomass resources.







## 25 countries, six donors – one goal

In December 2004, the Dutch Ministry for Development Cooperation (MFA) and the German Federal Ministry for Economic Cooperation and Development (BMZ) initiated the programme EnDev which started working in September 2005. It had the initial objective of providing sustainable access to modern energy services to 3.1 million people by the end of 2009. The objective was surpassed with a total number of 5.1 million people. Consequently, the programme has been scaled up several times. The target was increased to 19 million people by the end of 2022.

In 2011, the Norwegian Ministry of Foreign Affairs joined the partnership. The UK Department for International Development and the Swiss Federal Department of Foreign Affairs through the Swiss Agency for Development and Cooperation (SDC) followed in 2012. The Swedish International Development Cooperation Agency became the latest partner in 2015. The EU and Irish Aid have joined EnDev as co-financers. From 2012 until 2016, the Australian Agency for International Development was part of EnDev's Governing Board.

The executive organisations are the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) in cooperation with the Dutch Over Rijksdienst voor Ondernemend Nederland (RVO). Country activities are implemented in addition to GIZ by a broad spectrum of organisations, among them SNV, Hivos, Practical Action, MAEVE, ADES, AVSI and CLASP.

Thanks to its different donors, EnDev supports people in gaining access to energy in 25 countries. With its international basis of organising institutions, the programme transcends national borders and is a sound example of donor harmonisation.



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