



Annual Planning 2016

Energising Development – Phase 2



Partnership between

The Netherlands Ministry of Foreign Affairs

The German Federal Ministry for Economic Cooperation and Development

The UK Department for International Development

The Norwegian Ministry of Foreign Affairs

The Australian Department of Foreign Affairs and Trade

The Swiss Agency for Development and Cooperation

With co-financing from **Irish Aid** and the **EU**

Coordinated and implemented by:

The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Rijksdienst voor Ondernemend Nederland (RVO)

Netherlands Development Organisation (SNV)

Association pour le Développement de l'Énergie Solaire Suisse (ADES)

Humanistisch Instituut voor Ontwikkelingssamenwerking (HIVOS)

MAEVE

Practical Action

Published by:

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Celebration of 10-years EnDev at the Vienna Energy Forum

The Energising Development Partnership (EnDev) celebrated its 10th anniversary at the 2015 Vienna Energy Forum and hosted a high-level reception at the Vienna Hofburg together with the German Permanent Mission to the UN. On 18th of June, more than 600 guests followed the invitation to celebrate the jubilee of the multi-donor, multi-implementer energy access partnership.

The principal guests Dr. Kandeh Yumkella, special representative of the UN Secretary General and CEO of SE4ALL, Mr. Taizo Nishikawa, Deputy to the Director-General UNIDO, Mr. Fischer, Representative of the German Foreign Office, and the Dutch Ambassador Mr. Van Wulfften-Palthe praised the value EnDev has added to the international development agenda over the last ten years in their welcoming speeches. They honoured EnDev as most successful globally acting energy access programme impacting with strong outcomes such as facilitating energy access for 14 million people worldwide by December 2014, mitigating climate change, reducing health risks, fostering socio-economic development and generating employment especially for the rural poor in 24 partner countries. The multi-donor, multi implementer partnership approach, uniting Germany, the Netherlands, the United Kingdom, Australia, Norway and Switzerland and various implementing agency to a strategic alliance in the field of basic energy services was particularly highlighted. EnDev has been termed as flagship programme to alleviate global energy poverty and as pioneer in establishing local markets for climate-friendly energy technologies.



Celebratory cut of the anniversary cake by Dr. Kandeh Yumkella (CEO of SE4ALL) at the Vienna Energy Forum, joint by EnDev donor representatives Mr. Ronald Goldberg (DGIS), Ms. Kerstin Faehrmann (BMZ), Ms. Kari Bjørnsgaard (NOR Ministry of Foreign Affairs), Laurent Widmer (SDC)(not in the picture) and Dutch Ambassador van Wulfften-Palthe.

Contents

- A. EnDev in 2016 – trends and challenges..... 1**
 - EnDev’s medium term approaches and theory of change..... 1
 - Implementation of the approaches in 2016 3
 - EnDev targets and monitoring and evaluation plans 4
 - Global tracking of energy access and international discussions about criteria to define access to modern cooking 6
- B. Overview on current status of the EnDev 2 programme 9**
 - Outcome figures..... 10
 - CO₂ savings..... 13
 - Health 14
 - Gender impact..... 14
 - Job creation..... 16
 - Leverage..... 16
- C. Overview about planned country activities in 2016 18**
- D. Overview about planned general EnDev activities in 2016..... 22**
 - Cooperation with other organisations and initiatives..... 22
 - Impact Monitoring and Evaluation 24
 - Public relation activities..... 24

Tables and Figures

| | |
|---------------------------------------------------------------------------------------------------------------------------------------------|----|
| Table B.1: Overview of technologies supported in EnDev projects | 9 |
| Table B.2: EnDev 2 outcomes according to the tier system for electrification..... | 12 |
| Table B.3: EnDev tier system for improved cookstoves..... | 12 |
| Table C.1: Ongoing country activities under EnDev 2 without changes | 18 |
| Table C.2: Country activities intended to be extended without up-scaling..... | 19 |
| Table C.3: Country activities intended to be scaled up (bridge financing) | 19 |
| Table C.4: Country activities intended to be scaled up and extended (bridge financing) | 19 |
| Table C.5: Regional activities as additional projects (RBF 3)..... | 20 |
| Table C.6: EnDev RBF portfolio in three tranches and their budgets | 20 |
| | |
| Figure A.1: Simplified model of market systems for energy devices and services. | 2 |
| Figure A.2: Multi-level matrix for access to cooking solutions by SE4ALL | 6 |
| Figure B.1: Funding by region..... | 10 |
| Figure B.2: Funding by countries..... | 10 |
| Figure B.3: Adjusted number of household members provided with modern energy services in a sustainable manner (EnDev 2) | 11 |
| Figure B.4: Development of EnDev 1+2 adjusted figures per semester | 11 |
| Figure B.5: Adjusted number of household members provided with modern energy services in a sustainable manner (EnDev 1 and 2 combined)..... | 13 |

List of RBF tables

| | |
|----------------------------------------------------------------------------------------------------------|-------------------------------------------|
| RBF for picoPV in Bangladesh..... | Fehler! Textmarke nicht definiert. |
| RBF solar products promotion in Benin | Fehler! Textmarke nicht definiert. |
| RBF for improved cookstoves, Ethiopia | Fehler! Textmarke nicht definiert. |
| RBF Building sustainable and affordable credit lines for small solar systems in rural areas, Kenya | Fehler! Textmarke nicht definiert. |
| RBF Market creation for private sector operated mini-grids in Kenya (solar hybrid mini-grids)... | Fehler! Textmarke nicht definiert. |
| RBF Higher tier cookstove market acceleration project, Kenya..... | Fehler! Textmarke nicht definiert. |
| RBF for a sustainable market of hood stoves in Nepal | Fehler! Textmarke nicht definiert. |
| RBF Getting to universal access in thermal energy services in Peru.. | Fehler! Textmarke nicht definiert. |
| RBF solar lighting, Rwanda | Fehler! Textmarke nicht definiert. |
| RBF renewable energy village mini-grids, Rwanda | Fehler! Textmarke nicht definiert. |
| RBF for solar picoPV in the Lake Zone, Tanzania..... | Fehler! Textmarke nicht definiert. |
| RBF for domestic biogas, Vietnam | Fehler! Textmarke nicht definiert. |



Key achievements since 2005

Energy access for

14.8 million

people accomplished

11.2 million

household members with
improved cookstoves



3.6 million

household members with
electricity





Key achievements since 2005

1.6 million t of CO₂ saved per year – equivalent to planting of more than 3 million trees

A total installed power of **23.000.000** Watt with renewable energies

30,500 small and medium enterprises with a modern form of energy for productive uses

More than **37,000** technicians, stove producers, sales agents etc. trained



17,700 social institutions with a modern form of energy: among them 10,400 schools and 800 health centres

6.1 million women and children with drastically reduced exposure to indoor air pollution



A. EnDev in 2016 – trends and challenges

In the first half of 2015, EnDev facilitated sustainable access to modern energy services for additional **850,000** people, increasing the total number of people benefiting from the programme to **14,750,000**. Most country projects can implement planned activities without major interference. Only in a few countries unforeseeable events like the earthquake in Nepal and the instable political situation around the presidential elections in Burundi seriously affected the project work and make a reorientation of the country measures necessary. Thus, the basic conditions for the development of the programme in the second half of 2015 and in 2016 are good. It is expected that the number of additional beneficiaries will presumably rise by roughly 1.5 million in the next 18 months so that the programme will outreach the defined target of 15 million people for the period 2009 – 2015.

EnDev's medium term approaches and theory of change

EnDev's mission is to promote sustainable access to modern energy services for households, small and medium enterprises, schools, health centres and community centres in developing countries as necessary means to inclusive social, economic and low carbon development. In addition to the access objective EnDev has a strong climate mitigation and adaptation orientation, clear targets regarding gender and job creation and is emphasising the nexus to health and to different productive sectors especially in rural areas. EnDev focuses its activities mainly on decentralised small to medium scale energy solutions that are especially suited for rural communities but also supports grid activities to a limited extent. EnDev interventions comprise business development, technical, policy, advocacy, awareness-raising, and grant financing support.

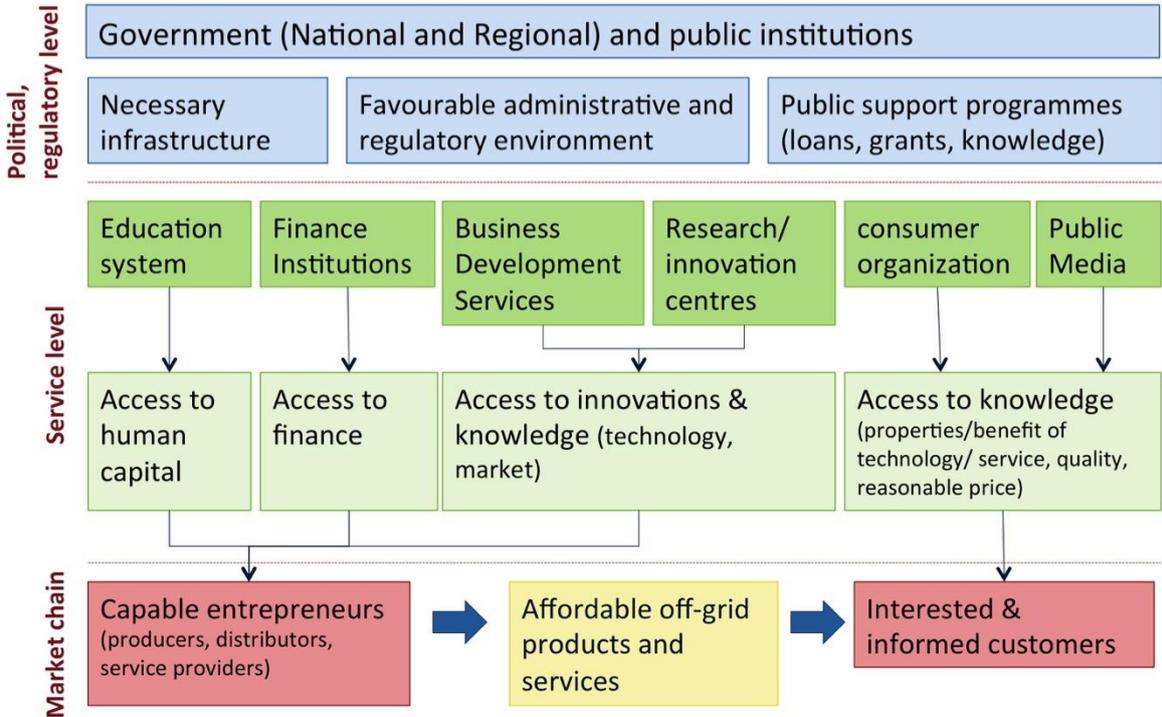
Grid approach: In grid connected areas where many households are still not served EnDev supports grid densification and small scale grid extension. Critical bottlenecks addressed by EnDev are connections costs and quality/safety of connections and electricity use. Once these are overcome poorer households are generally able to pay monthly electricity bills. EnDev implements a mix of four approaches in close cooperation with utilities and local authorities: **a)** electricity users are supported to reduce the costs of connection, as in several countries connection fees are not affordable for poor households; these costs comprise two main components: electricity meter and installation cost (material, labour cost). EnDev usually pays partially the share of the beneficiary. **b)** EnDev negotiates with utilities the possibility to pay connection fees by instalments. Clients pay the monthly rates in cash or in credit schemes. In a variation of this approach EnDev is facilitating up-front saving structures for households anticipating to connect to the grid. **c)** EnDev provides capacity development training of local technicians to improve quality and safety of indoor installations and **d)** EnDev carries out awareness campaigns regarding electricity use and safety measures. EnDev's approaches are designed to be complementary to development cooperation programmes directed towards grid extension and investments in centralised electricity generation in large scale.

Mini-grid approach: EnDev is supporting the installation of mini-grids as well as their financially viable operations. EnDev is not bound to a specific ownership concept. Mini-grids can be owned and operated by private entrepreneurs, a utility, the community or a hybrid structure. The focus of the activities is more on ensuring a high quality of the installations, and the professional technical and financial management of the systems. EnDev is partly providing investment grants, partly temporary subsidies for the electricity service to customers in form of results-based financing if lack of access to financing is a key bottleneck. In case of private investors EnDev is moderating the discussion with national authorities to create supportive framework conditions for the investments (favourable import duties and taxes, transparent and less bureaucratic permit and licence procedures, flexible tariff regulations, FiT type public tariff support). EnDev is strongly engaged in technical assistance and training for operators regarding business models, financial management, tariff setting, maintenance, and the promotion of productive use of electricity.

Off-grid and cooking approach: For off-grid electric technologies and for cooking systems EnDev is supporting the development of inclusive markets offering services and technologies that are affordable and meet basic needs of poor consumers. Starting point for any intervention on country level is an analysis of the market system with its three levels (see figure A.1).

EnDev country activities aim at strengthening the supply and the demand side of the market chain to increase the commercial viability of decentralised energy services. For this purpose the country/region specific bottlenecks and structural barriers are identified impairing the capability of entrepreneurs to provide affordable devices and services of adequate quality to low income customers and preventing consumers from purchasing goods that would improve the living conditions. Each market has its specific characteristics regarding capability of entrepreneurs, investment risks, productivity, economies of scale, quality of products, income level of customers, awareness, misconception of technologies and distribution infrastructure. In addition, markets in an early stage are generally suffering from other barriers than more advanced markets. Hence, each market has to be analysed specifically and regularly.

Figure A.1: Simplified model of market systems for energy devices and services.



EnDev projects look for stakeholders at the service level in their respective country which could contribute to overcome key barriers and strengthen entrepreneurs and customers. Cooperation with selected partners is mainly focussed on information and knowledge management, training, introduction of innovations, networking and awareness creation. EnDev has only a limited mandate to provide financial support to companies and/or finance institutions. In cases, where affordability and/or very low profitability of businesses are major constraints EnDev country projects are free to enhance market development or to ensure a basic energy service level through results-based financing and other forms of temporary subsidies and revenue support. Projects are advised to provide any financial support in a way that distortions of markets and a culture of dependency are avoided.

EnDev targets especially small and medium local companies in the market chain and aims at enhancing their capacity to create as much value as possible in the partner countries and to increase new job opportunities. Consequently, EnDev supports local manufacturing of stoves and biogas digesters, and assembling of solar-powered devices. In addition EnDev is enabling a critical number of local supply chain intermediaries and retailers to improve their marketing infrastructure especially in rural areas. Most challenging is the development of a network of rural sales agents (so called "last

mile entrepreneurs”), which are in close contact to rural clients. However, EnDev supports import of high quality energy devices (solar, industrially produced stoves) too, interlinking with local distribution structures for rural sales. Eventually this will lead to a diversified menu of options for end consumers, typical for developing markets.

EnDev’s approach in the off-grid and cooking sector is also complementary to other development cooperation programmes. Some of them are directed towards supporting international operating companies with capital (grants and loans) and market intelligence services to enter the bottom-of-the-pyramid market. Other programmes focus on policy advice aiming at an improvement of the framework conditions for off-grid solar markets or on governmental promotion programmes for solar-powered devices and clean cooking solutions. EnDev strives for a coordinated approach towards sector/market development with other development partners where possible.

Implementation of the approaches in 2016

Grid approach: EnDev will continue to facilitate access to the grid in at least 6 countries (Ghana, Honduras, Mozambique, Nepal, Nicaragua, Peru, and Uganda). In the Latin American countries EnDev will focus its activities mainly on the improvement of in-house electric installations, and on punctual support, where extension programmes of utilities face bureaucratic problems. In Mozambique and Uganda grid extension will be co-financed through a results-based financing. In Nepal, EnDev will co-finance grid extension in combination with community training and promotion of productive use. In Ghana, EnDev will facilitate connection of water pumps and other productive equipment to the grid.

Mini-grid approach: EnDev will support installation and operation of mini-grids in at least 11 countries (Ethiopia, Honduras, Indonesia, Kenya, Liberia, Mali, Mozambique, Nepal, Nicaragua Rwanda, Senegal, and Uganda). In several of these countries a considerable number of already existing mini-grids have difficulties to achieve financial viability. Therefore, EnDev will invest into strengthening the management and tariff system of these mini-grids instead of investing resources in new installation. In other countries like Ethiopia and Liberia where mini-grids are still scarce EnDev is following a more parallel approach by contributing to new installations as well as enhancing the operation of existing ones. In Rwanda, EnDev continues to support private investments in mini-grids. Several new sites have been tendered for investments of private companies. EnDev is providing technical and business advice. EnDev activities in Kenya will follow the example of Rwanda and try to stimulate investments by the private sector by offering results-based financing in addition to capacity development and negotiations with regulator and government about permission for local tariffs.

Off-grid and cooking approach: EnDev will promote market development for photovoltaic systems (solar home systems, small solar home system, pico solar kits and solar lanterns) in at least 17 countries and for improved cooking systems (improved or advanced cookstoves, biogas) in at least 21 countries. Market development is at different stages in these countries depending on technology and region, therefore, requiring context specific interventions.

In general markets for pico solar kits and solar lanterns have gained considerable momentum in many African and Asian countries so that EnDev will concentrate its activities mainly on last mile entrepreneurs and on rural undersupplied regions and market segments. In addressing the specific market bottlenecks EnDev will work as much as possible in coordination/cooperation with other development partners. In contrast, markets for solar home systems have reached commercially viable levels on a large scale only in few countries such as Bangladesh. Thus, activities to promote solar home systems generally require a set of interventions to overcome various bottlenecks such as affordability, lack of technical skills for installation, lack of maintenance and repair infrastructure.

Market development for improved cooking systems is complex. Affordability and the willingness to pay higher prices for stoves are generally low among energy poor households. As a result, high quality stoves with strong positive health and energy impacts are difficult to bring to the market if the price significantly exceeds current expenditures for traditional cooking systems. EnDev follows a parallel strategy by supporting continuous improvements of locally produced stoves in the low price segment as well as the introduction of technically more advanced cooking systems (stoves and

biogas) for households willing to pay an adequate price for the higher quality and service level. The concrete interventions depend on the specific bottlenecks and stage of market development in the different countries and regions.

EnDev targets and monitoring and evaluation plans

In addition to the main objective of the partnership to facilitate access to modern energy technologies and services, EnDev has 4 impact targets: **a)** climate mitigation, **b)** health prevention, **c)** improved gender balance, **d)** job creation, and 2 outcome targets: **e)** leveraging of funds and **f)** increase of power generation with renewable energies.

Climate mitigation impact: EnDev promotes the use of renewable energies for rural electrification, the substitution of fossil fuel-based technologies (e.g. kerosene lamps) and an increased efficiency of biomass-based energy applications (improved cookstoves, biogas plants). All three activities contribute to decrease greenhouse gas emissions.

Reduction of CO₂ emissions is calculated with the help of UNFCCC approved methodologies:

- AMS-I.I.: Biogas/biomass thermal applications for households/small users
- AMS-II.G.: Energy efficiency measures in thermal applications of non-renewable biomass
- AMS-III.AR.: Substituting fossil fuel based lighting with LED/CFL lighting systems

In 2016, EnDev will also apply the following methodologies: AMS-I.F. Renewable electricity generation for captive use and mini-grid.

For improved cookstoves, which consume 20-50% less biomass, an annual CO₂ reduction of about 0.5 t-1.0 t per household is assumed on average, depending on stove technology, user behaviour, fuel quality and fuel origin. In addition, a significant reduction of particulate matter and soot (black carbon) is achieved due to a better and more complete combustion. EnDev's objective is that per EUR 100,000 committed at least 400 t of CO₂ equivalent (CO_{2e}) emission will be saved per year. This shall be achieved if at least 600 households are sustainably using improved cookstoves (minimum half of these households shall be using at least "tier 2" stoves). EnDev will carry out household surveys in 2016 to analyse more in detail the use pattern of different stove technologies and thus verify to which extent biomass use and emissions are reduced.

For solar home systems and solar lanterns the effect of replacing kerosene lamps is calculated the following way: It is assumed that kerosene lamps consume on average 0.03 litres of kerosene per hour with emissions of 2.4 kg CO₂ per litre, and daily use time of 3.5 hours on average. Assuming these values, replacing one kerosene lamp will reduce CO₂ emissions by 0.09 t of CO₂ per year. Kerosene lamps emit also significant amounts of black carbon. Around 7-9% of the fuel is transformed into soot particles during the process of combustion in kerosene lamps. EnDev is currently not including black carbon in the calculation of the climate mitigation effect.

In 2016, EnDev will collect more systematically information on the use of kerosene lamps for lighting in the project areas based on household surveys and review current methods to assess the climate effect of black carbon.

Health impact: Cooking with solid biomass and rudimentary stoves causes toxic emissions that lead to severe health problems such as chronic lung diseases, acute respiratory infections, cataracts, blindness, and adverse effects on pregnancy. EnDev's new target is to reduce the health burden caused by smoke and soot in kitchens and cooking sites for at least 1,500 people for every EUR 100,000 spent. The target shall be achieved by using cooking systems that represent at least level 2 of the classification matrix of the Global Tracking Framework of SE4ALL or a similar system for the health attribute. In the international debate on access to clean cooking it is suggested to promote clean cookstoves such as gasifier, gas and electric stoves and switching to liquid and gaseous fuels for heating and cooking purposes. However, most of the 2.9 billion people using traditional, inefficient and unhealthy cooking systems will not be able to afford this kind of stoves and the use of LPG or electricity for heating and cooking in the short and medium term at least. They will continue to use wood and charcoal as the predominant fuel. Nevertheless, clean cooking can be

achieved by a concept combining proper use of solid biofuels, energy efficient cookstoves, use of hoods and chimneys, and good ventilation. In addition, EnDev will continue to promote gasifier stoves and biogas digesters as far as there is a reasonable demand for these systems.

Gender: EnDev's objective is supporting local energy markets to serve the energy poor, in due consideration of gender equality with regards to access and usage of energy as well as to production and supply of technologies and services. To monitor and assess gender related effects, EnDev regularly reviews its impact studies concerning gender aspects. In addition, EnDev has incorporated gender-disaggregated data collection in the monitoring routines. Within the RBF projects EnDev is increasingly ensuring that data on RBF beneficiaries as well as end consumer is collected in a gender-sensitive manner through the financial institution as well as the companies. The RBF evaluation which is being conducted over the next 3 years will also look in more detail into questions of economic benefits at enterprise level and job creation in consideration of gender aspects. In the future EnDev intends to extend the gender-disaggregated data collection to job creation in other sectors as well as ownership structures of businesses. In addition a questionnaire for gender impact studies is under development and shall be tested.

Job creation: EnDev aims at directly creating at least 5 jobs along the value chain of the supported energy technologies or as a result from benefitting from the access to modern energy technologies for every EUR 100,000 invested by the programme. As a first step, the number of working days for manufacturing and installing stoves has been calculated based on the assumption that a typical improved cookstove (either made by clay or iron sheet) is produced and installed in about 90 minutes. In the present reporting period data collection was refined by analysing the working time for manufacturing and installing stoves more in detail for the different types of stoves and according to regions. In 2016, the monitoring will also include a calculation on jobs created in the marketing of stoves and off-grid solar systems. A first estimate will already be provided in this report in chapter B.

Leveraging effect: EnDev's aim at creating and enhancing pro-poor energy markets is closely linked to the mobilisation of public and private financial resources for manufacturing and commercializing renewable energy products and services. Expenditures of 100,000 EUR by the programme shall stimulate on average at least 200,000 EUR spent by private households, the private sector and the public sector for renewable energy technologies. EnDev works mainly with small and medium scale enterprises including the informal sector. Therefore, leveraging effects are not visible in the form of large-scale capital investments but rather in the form of small investments in goods and services such as raw materials, semi-finished goods, or transport and services purchased from various sources. These intermediate inputs are used in the production and commercialization process to produce and market goods or services along the market chain to the final product and service.

For stoves and off-grid solar products the contribution paid by beneficiaries, the investment of private companies working together with EnDev for starting, maintaining or expanding their operations, and the capital raised by public partners supporting initial market development can be attributed to the programme's work. To get an overall picture of economic activities and possible leveraging effects EnDev is currently calculating two types of figures: **a)** the total value of stoves and off-grid solar systems sold by companies closely cooperating with EnDev; **b)** the total value of all expenditures for intermediate inputs along the market chain. For locally produced stoves a simplified supply chain of three actors is assumed: raw material supplier, manufacturer and retailer. The majority of the capital is being reinvested several times while, at the same time, profit margins are small, thus multiplying the investment effect by approximately 1.5. In the case of products that are manufactured abroad the importer will be a fourth actor in the chain adding additional 0.7 points of investments. Mini-grids do not have such a distinct supply chain, thus the total installation costs are used as a conservative proxy, while for grid extension and densification projects, where accurate extensions costs are often not easily available, an average cost of EUR 1,500 per connection is presumed.

One additional aspect being considered to come up with eligible figures is sector development, investments outside of the EnDev monitoring which nevertheless can be directly traced back to the programme's involvement. This includes imitators / copy cats and companies that are inspired by

EnDev activities and therefore involved in the energy service market. It is estimated that these actors raise about the same amount of capital that EnDev beneficiaries and partners do. The total cash flows in the respective national sectors are yet multiple times beyond this figure and will not be attributed to EnDev.

EnDev will further refine the leveraging concept and study as a possible third leverage figure the total value of investments into goods which are not consumed.

Power generation with renewable energies: EnDev pursues the objective to promote electric power generation based on solar, hydro and wind energy. EnDev expenditures of EUR 100,000 shall result in the installation of at least 500 Watt (W) of electrical power based on renewable energy. The monitoring system records the capacity of EnDev supported power plants feeding into the grid as well as the capacity of mini-grids and SHS. For the large amount of picoPV systems an average of 3 W is assumed.

Global tracking of energy access and international discussions about criteria to define access to modern cooking

In 2015, EnDev has been strongly involved in the elaboration of a revised version of the multi-tier system to measure access to sustainable energy as contribution to the Global Tracking Framework of the SE4ALL initiative¹. The systems for access to electricity and for access to cooking on household level are applied in the monitoring cycles of EnDev and results are reported in the Progress Reports and Annual Planning documents. In addition, EnDev developed an updated version of a tablet application to carry out household surveys on energy access based on the SE4ALL questionnaire. In 2016, EnDev will use the tablet application in several countries to obtain an overview about the status of energy access in relevant project regions.

Figure A.2: Multi-level matrix for access to cooking solutions by SE4LL

The multi-tier system for cooking of SE4ALL has still not been finalized in all aspects. Open questions exist especially regarding the health (indoor air quality) attribute of the cooking system. Thus, no acceptable threshold values are defined for concentrations of particulate matter and carbon monoxide in kitchens on level 1-3. It is also not clear, which statistical, survey or monitoring data are needed to be able to assess the indoor air quality if direct measuring of PM and CO concentrations are not possible, and which proxy indicators could be used to characterize indoor air quality at levels 0-3.

| | | LEVEL 0 | LEVEL 1 | LEVEL 2 | LEVEL 3 | LEVEL 4 | LEVEL 5 | |
|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|-------|
| ATTRIBUTES | 1. Indoor Air Quality | PM2.5 (µg/m3) | [To be specified by a competent agency such as WHO based on health risks] | [To be specified by a competent agency such as WHO based on health risks] | [To be specified by a competent agency such as WHO based on health risks] | < 35 (WHO, IT-1) | < 10 (WHO guideline) | |
| | | CO (mg/m3) | | | | < 7 (WHO guideline) | < 7 (WHO guideline) | |
| | 2. Cookstove Efficiency (Not to be applied if cooking solution is also used for space heating) | | Primary solution meets Tier 1 efficiency requirements [to be specified by a competent agency consistent with local cooking conditions] | Primary solution meets Tier 2 efficiency requirements [to be specified by a competent agency consistent with local cooking conditions] | Primary solution meets Tier 3 efficiency requirements [to be specified by a competent agency consistent with local cooking conditions] | Primary solution meets Tier 4 efficiency requirements [to be specified by a competent agency consistent with local cooking conditions] | | |
| | 3. Convenience | Stove preparation time (min/meal) | | | < 7 | < 3 | < 1.5 | < 0.5 |
| | | Fuel acquisition and preparation time (hrs/wk) | | | < 15 | < 10 | < 5 | < 2 |
| | 4. Safety of Primary | IWA safety tiers | | | Primary solution meets (provisional) ISO Tier 2 | Primary solution meets (provisional) ISO Tier 3 | Primary solution meets (provisional) ISO Tier 4 | |
| | | OR Past accidents (Burns and un-intended fires) | | | | | No accidents over the past year that required professional medical attention | |
| 5. Affordability | | | | | | Levelized cost of cooking solution (including cookstove and fuel) < 5% of household income | | |
| 6. Quality of Primary Fuel: variations in heat rate due to fuel quality that affects ease of cooking | | | | | | No major effect | | |
| 7. Availability of Primary Fuel | | | | | | Primary fuel is readily available for at least 80% of the year | Primary fuel is readily available throughout the year | |

Note: CO = carbon monoxide; ISO = International Organization for Standardization; IWA = International Workshop Agreement on Cookstoves; PM = particulate matter

¹ Beyond connections: Energy Access Redefined (ESMAP Technical Report 008/15)

EnDev suggests using exposure limits for workplaces to define threshold values for level 1-3, as the majority of people in developing countries stay in the kitchen only for less than 8 hours per day. Hence, the indoor air pollution situation in kitchens is comparable to that at workplaces. To simplify monitoring in the field EnDev is using a proxy indicator to assess the health risk of cooking systems. The proxy indicator is combining information on the type of fuel (firewood, charcoal, solid organic waste, liquid or gaseous fuels), the type of stove (improved biomass stove, gasifier, gas stove), the type of cooking space (outdoor, indoor) and the degree of air exchange (use of hood, flues or chimney, windows and kitchen openings). All these factors have a significant impact on the exposure of household members to pollutants emitted during cooking.



Massaër Guéye: a local tinsmith becoming a national stove enterprise

“At the beginning of my carrier I was a small tinsmith with one apprentice. We produced about 10-20 local stoves a month.

In 2010, I was trained by FASEN to produce the Jambar and Sakkanal (improved cookstoves). I was given some materials and was introduced to the producers of ceramic liner which we need to produce the Jambar stove. This was the beginning of my transformation. I started to produce and sell more than 100 stoves per month.



In 2013 I was given the chance by the project to further improve my production system. In a cost-sharing arrangement, I could modernise my production facilities with some machines. I also learned 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 am employing 22 people that are earning between EUR 3 and EUR 6 per day each. I am selling my stoves in all regions of Senegal with my own distribution network.



I used the profits to acquire some land and I build a new production centre for more than EUR 21,000. I also bought a lorry, a car and a motorbike which I use for the selling of the stoves. I even carry out my own sensitization meetings when I introduce my stoves into new markets.

Finally, I also started to produce my own inserts. Now I am managing the full supply chain of my stoves: from the production of all parts up to the sale to the end customer throughout the country.



Thanks to these achievements, my life has improved a lot! I could pay for my marriage and can pay for all the costs of my family. I definitely will continue to produce and sell the ICS for a long time.”





Cambodia: This biodigester system is under construction. The picture shows a pig (as source of fuel), the overflow and in the background the farm house.



Ethiopia: The handing over ceremony of the solar powered health centre in Gebaba took place in June 2015 with high-level participation from Ethiopia, Ireland, the Netherlands and Germany.



Mozambique: Micro hydro turbine locally produced by Metalurgica in Chimoio, Manica province



Bolivia: EnDev M&E advisor Gabriela Gemio conducts an interview during one of her regular field visit, collecting data in order to include the continual feedback from end-users.

B. Overview on current status of the EnDev 2 programme

This chapter provides information on energy access outcome, health impacts and CO₂ emission reduction for phase 2 starting in 2009 and/or the entire phase EnDev 1 plus EnDev 2 starting in 2005. Since the beginning of 2015, EnDev also reports on specific job creation, leverage and gender indicators.

By mid-2015, the EnDev partnership comprised 29 projects in 26 different countries, with side activities in additional 4 countries. EnDev supports access to improved cooking systems in 18 of the 29 projects, access to off-grid solar technologies (solar home systems and solar lanterns) in 17, access to mini-grids (solar/hybrid or hydropower) in 11 projects, grid extension in 11 projects and biogas in 4 projects (see table B.1).

Table B.1: Overview of technologies supported in EnDev projects

| | | stoves | biogas | other cooking/thermal | SHS | picoPV | solar mini-grid | hydro mini-grid | grid | other lighting/electricity |
|------------------------|----------------------------------------------------|--------|--------|-----------------------|-----|--------|-----------------|-----------------|------|----------------------------|
| country projects | Bangladesh | | | | | | | | | |
| | Benin | | | | | | | | | |
| | Bolivia | | | | | | | | | |
| | Burkina Faso | | | | | | | | | |
| | Burundi ² | | | | | | | | | |
| | Cambodia | | | | | | | | | |
| | Ethiopia | | | | | | | | | |
| | Ghana | | | | | | | | | |
| | Indonesia | | | | | | | | | |
| | Indonesia biogas | | | | | | | | | |
| | Kenya | | | | | | | | | |
| | Liberia ³ | | | | | | | | | |
| | Madagascar | | | | | | | | | |
| | Malawi | | | | | | | | | |
| | Mali | | | | | | | | | |
| | Mozambique | | | | | | | | | |
| | Nepal | | | | | | | | | |
| | Peru | | | | | | | | | |
| | Rwanda | | | | | | | | | |
| | Senegal | | | | | | | | | |
| Tanzania | | | | | | | | | | |
| Uganda | | | | | | | | | | |
| Vietnam | | | | | | | | | | |
| multi-country projects | Bangladesh, Kenya | | | | | | | | | |
| | Central America (Honduras, Nicaragua) ⁵ | | | | | | | | | |
| | Kenya, Tanzania, Uganda | | | | | | | | | |
| | Malawi, Mozambique | | | | | | | | | |
| | Mekong (Cambodia, Laos, Vietnam) | | | | | | | | | |
| | Mozambique, Uganda | | | | | | | | | |

² with some activities in Congo

³ with some activities in Guinea and Sierra Leone

⁴ focus is on off-grid appliances

⁵ with some activities in Guatemala

Outcome figures

By June 2015, EnDev 2 facilitated sustainable access to modern energy services and technologies for about **9.74 million people**. Of these, 2.78 million people (28%) were connected to the central grid or a mini-grid, or used standalone electric systems. 6.97 million (72%) are now using improved cooking technologies, such as improved firewood and charcoal stoves or biogas plants (figure B.3). In addition, **10,300 social institutions** gained access to electricity or improved cooking systems and **19,700 small and medium enterprises** now have access to a modern form of energy for productive use.

The focus of the EnDev programme is on Sub-Saharan African countries. Around 57% of the committed EnDev 2 funds are currently allocated to this part of Africa (figure B.1). The share of least developed countries (LDC) supported by EnDev is 60% (figure B.2).

The outcome figures reported in this report are verified in the field through detailed lists of customers of energy services and products, and/or sales figures of energy companies and retailers. In cases when not only EnDev but other international partners have been involved, only a part of the outcomes are counted according to the financial share of EnDev in the total cost of a measure. EnDev does also not simply sum up outcomes achieved in the course of the programme but tries to capture those processes which **reduce outcomes** through so-called adjustment factors. Thus, figures of six-month reporting periods are adjusted down before the total number of beneficiaries is presented to donors and the public.

EnDev applies four adjustment factors:

- a “sustainability adjustment factor”, which takes into account that the access provided to modern energy technologies is not sustainable in all cases;
- a “windfall gain factor”, considering that some beneficiaries supported by EnDev would have gained access to modern energy services anyway even without support;
- a “double energy factor”, which accounts for beneficiaries which already have access to modern energy services in the same category (modern cooking energy technologies or electricity);
- a “double EnDev counting factor”, which ensures that beneficiaries whose access to both cooking energy and electricity is facilitated by EnDev are only counted once in the aggregate figure.

In addition, the EnDev figures already include a discount for **replacement** which reflects the limited lifespan of some of the technologies promoted. This typically concerns cookstoves and picoPV devices: in order to continuously benefit from the service, the system may have to be bought more than once over the course of the project period. Some of the later-stage sales will go to beneficiaries reported before. It would therefore be wrong to simply add up all sales numbers. Only sales beyond replacement generate new access.

In the past, EnDev has subtracted 100% of the systems after their estimated life-span. However, evidence emerges that this approach may be overly conservative. Not all systems registered in EnDev’s monitoring require replacement: for example, people buy replacement systems from providers not captured by EnDev’s monitoring. EnDev currently develops an enhanced replacement logic which takes these and related aspects into account.

Figure B.1: Funding by region

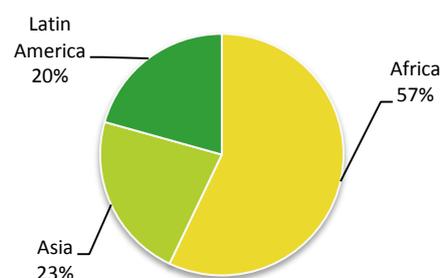


Figure B.2: Funding by countries

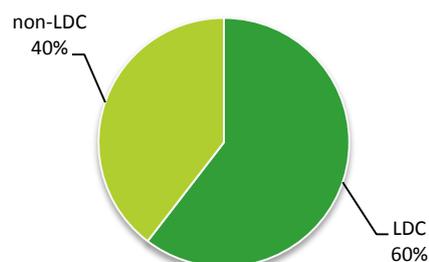


Figure B.3: Adjusted number of household members provided with modern energy services in a sustainable manner (EnDev 2)

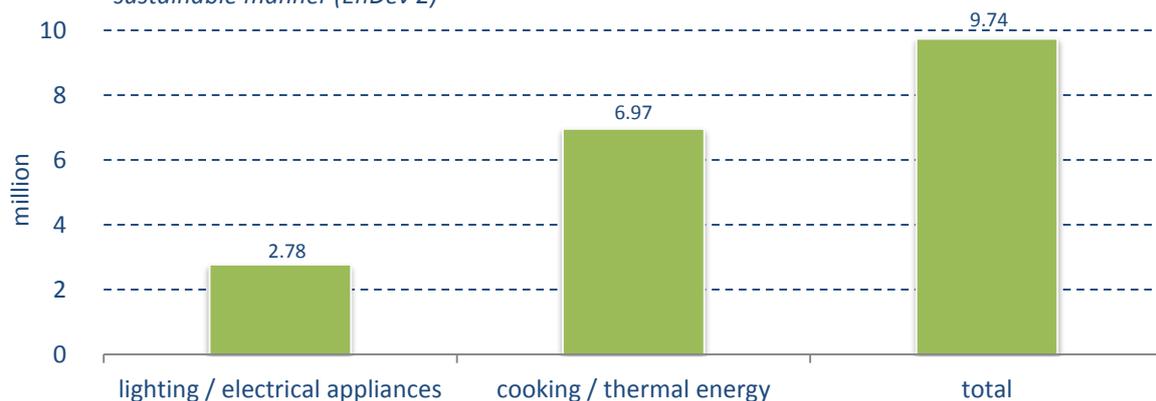


Figure B.4: Development of EnDev 1+2 adjusted figures per semester



We expect that the outcomes for the second semester of 2015 will be again above 500,000.

Access to electricity

EnDev uses a tier system to define different levels of **access to electricity**. In this system access to electricity is defined in terms of services, for which both “energy” and a device turning the energy into a useful service are required. As it is often difficult to directly monitor a service, access can be claimed by demonstrating access to the respective device and the required energy. Alternatively, access can be claimed on the grounds of certain electricity consumption.

The EnDev tier system is aligned with the tier system of the SE4ALL global tracking framework. Based on this system the EnDev electrification outcome figures in the different tiers for the EnDev 2 phase are as follows:

Table B.2: EnDev 2 outcomes according to the tier system for electrification

| Tier | Services | Typical system | Number of people | Percent |
|------|-------------------------------------------------------------------------------------------------------------|----------------------------------|------------------|------------|
| 5 | tier 4 services plus use of devices typically requiring a few kilowatt like air conditioners | grid | 288,135 | 10.39 |
| 4 | tier 3 services plus use of devices typically requiring a kilowatt like water heaters, irons | limited grid | 180,006 | 6.48 |
| 3 | tier 2 services plus use of devices typically requiring a few hundred watt like rice cookers, refrigerators | mini-grid | 114,762 | 4.13 |
| 2 | bright light, radio, telephone plus use of devices typically requiring tens of watts like TV, video, fan | solar home system | 1,812,217 | 65.29 |
| 1 | medium bright light and, if possible, limited radio use and telephone charging | picoPV, battery charging station | 380,463 | 13.71 |
| | | total | 2,775,583 | 100 |

These figures reflect only those people which had no access to electricity beforehand. In several cases EnDev facilitated a better access (higher tier) for households that already had at least basic access to electricity (minimum tier 1). The number of beneficiaries whose access was raised to a higher level is 163,690.

Access to improved cooking devices

The tier system for improved cookstoves is internationally still work in progress (see chapter A). Applying the current methodology as laid down in the last version of the Global Tracking Framework and – in parallel – our current internal classification system, the EnDev outcomes of the second programme phase could be attributed to the 5 tiers as follows:

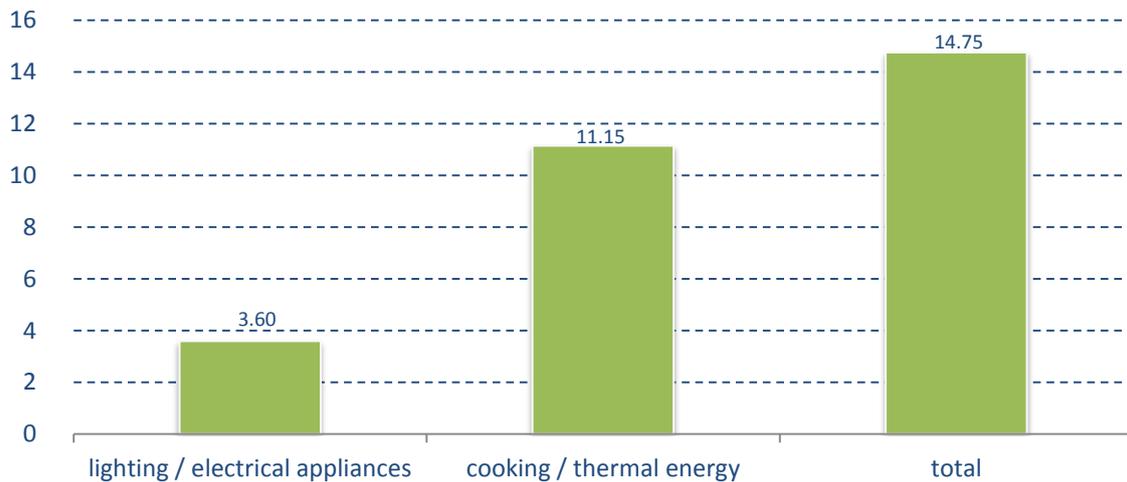
Table B.3: EnDev tier system for improved cookstoves

| Tier | Services | Number of people (EnDev methodology) | Percent |
|------|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------|------------|
| 5 | Access to needed quantity of energy source: ≥ very good Health protection: ≥ very high Convenience: ≥ very high | 0 | 0 |
| 4 | Access to needed quantity of energy source: ≥ good Health protection: ≥ high Convenience: ≥ high | 38,843 | 0.56 |
| 3 | Access to needed quantity of energy source: ≥ fair Health protection: ≥ fair Convenience: ≥ fair | 27,865 | 0.40 |
| 2 | Access to needed quantity of energy source: ≥ limited Health protection: ≥ sufficient Convenience: ≥ sufficient | 3,170,026 | 45.50 |
| 1 | Access to needed quantity of energy source: ≥ deficient Health protection: ≥ low Convenience: ≥ low | 3,648,950 | 52.38 |
| 0 | Access to needed quantity of energy source: ≥ highly deficient Health protection: ≥ very low Convenience: ≥ very low | 80,807 | 1.16 |
| | | 6,966,491 | 100 |

Overall outcome

Looking at the overall EnDev programme, starting from phase 1 in 2005 up to June 2015 in phase 2, the **total number of people** having gained sustainable access to modern energy services on household level amounts to **14.75 million** (figure B.5). The total number of **social institutions** is more than **17,800**; the total number of **small and medium enterprises** is around **31,700**, respectively.

Figure B.5: Adjusted number of household members provided with modern energy services in a sustainable manner (EnDev 1 and 2 combined)



CO₂ savings

An improved firewood cookstove, which saves 30% of firewood in practice and which is used to prepare 80% of all meals, saves around 0.55 t CO₂ per year (on average, over all EnDev stoves) compared to cooking on open fires. The total savings of all EnDev stoves for one year amount to approximately 1,321,630 t of CO₂. In addition, 193,615 t of CO₂ savings are generated for which emission reduction certificates are sold on carbon markets. Air pollutants as a result of incomplete combustion, including black carbon, are not included in this calculation.

One electric lamp powered by SHS and mini-grid or grid connections replaces at minimum two kerosene lamps, thus saving at least 0.18 t CO₂ per year. A solar lantern replaces approximately one kerosene lamp, saving 0.09 t CO₂ per year.



The total CO₂ saving of 2.5 million stoves and access to solar home systems, mini-grid connections or solar lanterns for 778,303 households supported by EnDev are 1,645,467 t of CO₂. For comparison: this amount corresponds to

- CO₂ emissions of all intra-European flights during 10.6 days, or
- Norwegian car traffic during 115 days, or
- annual household CO₂ emissions of a medium-sized city, for example, Leverkusen, Portsmouth, Enschede, Trondheim, Ballarat (Queensland) or Bern and Basel together or
- planting of more than 3 million trees on an area as big as 4,800 football pitches.

Health

As a result of EnDev activities the exposure level of indoor air pollution could be drastically reduced for more than 3.8⁶ million household members (particularly women and children). The improvement of the health protection was achieved by:

- reducing the quantity of emissions of particulate matters and CO through **a)** improved cookstoves with higher combustion efficiency, and lower heat losses **b)** improved fuel quality and **c)** fuel switch;
- removing pollutants from the cooking site through chimneys, flues, hoods or ventilation; and
- reducing exposure to pollutants through changed cooking practices and placing of the stove and kitchen.

The specific assessment of the health impact of promoted cooking solutions is based on the type of stove and fuel, the use of chimneys, flues or hoods, the degree of ventilation and the cooking place. Only cooking solutions classified as tier 2 or higher are considered as sufficiently safe regarding exposure of household members to indoor air pollution. These include all stoves using electricity or gaseous fuels as well as improved biomass stove (rocket stoves, gasifier stoves) used outdoor or with chimney or hood when installed or placed indoor.

Gender impact

The updated review of EnDev impact studies concerning gender-related effects provide ample evidence that access to modern energy improves:

- **employment of women and income generation:** Studies from Ethiopia and Kenya for example demonstrate that EnDev trained women started successful stove businesses (production/retailing), created employment for assistants, generated profit and have future plans for expansion. Women also proved to be creative local vendors of solar systems in Kenya;
- **medical services especially for women in health centres:** Electrified health centres in Ethiopia now provide service also during night time which is specifically important for women in the final stage of their pregnancy;
- **indoor air quality in kitchen areas:** In most cases women are responsible for cooking and thus benefit most from improved cookstoves that emit less pollutant. Considering the above figure on the number of people with access to tier 2 cooking solutions and assuming that 1/5 of the household members are women and 2/5 young children it can be concluded that around 760,000 women and 1.5 million young children benefit from improved health protection;
- **safety against sexual harassments,** due to electric light that provides safety and the reduction of collection time for firewood;
- **working conditions and comfort** due to improved cookstoves that are easier to use and the replacement of kerosene lamps with PV-powered lamps (e.g. studies in EnDev Bolivia and Ethiopia).

Gender-disaggregated monitoring data about full time job creation is presented in the next paragraph. Detailed job-creation effects of EnDev are currently analysed in an ongoing study in Kenya (results are expected at the end of 2015).

⁶ All members of households that use a stove fulfilling the level 2 criterion for the health attribute of the multi-tier matrix for cooking solutions.

Entrepreneurial spirit rising in Malawi: Joseph the investor of Chitetezo Mbaula business

Joseph Truwa is 25 year-old businessman from Lilongwe who trades agricultural commodities in Lilongwe. He has already seen the Chitetezo Mbaula – the local improved cookstove in Malawi – in different sales points in Lilongwe, but recently he heard about the Chitetezo Mbaula business from a friend. Joseph has studied business at university and “since then I have been always looking for new business opportunities”, he says. When he heard about this business possibility, he contacted the local EnDev partner NGO MAEVE in order to get more information on how to set up his own Chitetezo Mbaula business.

After talking to MAEVE, he went to the outskirts of Lilongwe to find a production site with a good clay source where the transportation is also relatively easy all around the year. With the suggestion of MAEVE, he has been looking into brick making communities where the clay is available and accessible during all seasons. He found a village close to brick production site and took a soil sample of 50 kg to have it tested by MAEVE. Once the quality of his clay had been approved, he started the business.

First, he managed to convince a group of people in the village to work for him in the cookstove production. Then, he organised trainings for his team and invested in building the kiln to fire the stoves. He will pay back the training cost to MAEVE in instalments with the stoves. Each month 20% of the stoves he delivers will be used to pay the training cost. According to his business plan, he will pay back the training loan in a few months and his profit will increase significantly afterwards. In his first trail production, he has loaded 180 stoves in the kiln. “I need to produce 400 stoves per month”, he remarks, “Then business is profitable for me”.



the He has a very clear business idea in his mind. Nevertheless, he faces some challenges in practice. Joseph says, “It is difficult to convince local people to work with me. At the moment people are not working with full energy, because they do not believe in this business yet. Once I come back with the money after the first sales, they will be more motivated.”

Joseph pursues business opportunities and makes them happen. Currently, he creates jobs for ten people at his production site. He believes in the Chitetezo Mbaula and once he breaks even, he wants to extend his business and look for another production site. EnDev Malawi keeps supporting entrepreneurs like Joseph in order to create a sustainable ICS market with a reliable supply.

Job creation

In the progress report for the year 2014, the number of full-time equivalent jobs which are created by EnDev in the cookstove sector was roughly estimated using an average manufacturing time of 1.5 hours per improved cookstove.

In this monitoring period, EnDev has gathered new data and more precise estimations. According to these, about 6,380 full-time equivalent jobs have been created in the production of stoves alone since 2009. This corresponds to 4.33 jobs per EUR 100,000 invested by EnDev. The monitoring reveals that more than half of these are for women.

In the future, EnDev will cover more steps along the supply chain for improved cookstoves (marketing, transport, installation, etc.) and more types of technologies (picoPV, etc.) to get a better estimate of job creation effect that EnDev provokes. As a first estimate it was calculated that an additional 2230 equivalent full-time jobs are created in the distribution chain for stoves. This corresponds to a total of 5.8 jobs per EUR 100,000 EnDev budget.

Leverage

In line with chapter A, EnDev determined two figures for this monitoring cycle:

The total value of all stoves and off-grid systems sold or installed by companies cooperating closely with EnDev was EUR 22.3 million, which is a ratio of 1.63 in relation to the programme expenditures of EUR 13.6 million.

The total amount of investments along the market chain including intermediary products but excluding expenditures for private consumption is about EUR 51.9 million in the current semester alone, representing a ratio of 3.82 in relation to the EnDev programme expenditures.

Bangladesh: Cooking on a Single Pot Bondhu Chula



Senegal: Electrification of rural villages with systems operating on a fee-for-service basis



Uganda: The Rocket stove



Peru: Farmers drying chili using a solar dryer in Inclán, Tacna

C. Overview about planned country activities in 2016

The total budget of the second phase is currently EUR 226.4 million. Below, an overview of all country activities is provided. Table C.1 gives an overview of on-going and unchanged projects (compared to the previous Annual Planning 2015 document). Country activities that are foreseen to be extended without up-scaling are presented in table C.2.

At the time of writing this report, several donors have announced additional funding for the EnDev programme. In some cases internal authorisation procedures are already underway. However, no legally binding commitment has yet been made. As a result of this situation, no up-scaling proposals are presented in this Annual Planning document. Rather, EnDev proposes a so-called **bridge financing** for some projects to secure operations in 2016 (see tables C.3 and C.4 below). As soon as additional funds become available, full up-scaling proposals covering project periods of 2-3 years will be developed.

RBF: Table C.5 presents a detailed overview of regional RBF project from the 3rd tranche which all began implementation in the present monitoring period. Table C.6 presents a general overview of the RBF projects across all three tranches.

Table C.1: Ongoing country activities under EnDev 2 *without changes*

| Country | Activities | Project duration | | Funding | Planned outcomes on HH level |
|------------------------|---------------------------------------------------------|------------------|-------|--------------------|------------------------------|
| | | start | end | in EUR 1,000 | in persons |
| Benin | grid, solar-RBF | 19/09 | 06/17 | 7,160 | 406,415 |
| Burundi | solar, stoves | 09/10 | 06/18 | 3,200 | 130,000 |
| Central America | solar, stoves, hydro, grid | 09/09 | 12/18 | 16,260 | 451,420 |
| Indonesia | solar, hydro | 05/09 | 07/18 | 11,960 | 172,000 |
| Kenya | solar, biogas, stoves, mini-grid | 07/09 | 06/18 | 19,435 | 6,550,000 |
| Liberia | solar, solar dryer, stoves | 05/12 | 05/17 | 3,200 | 50,500 |
| Malawi | solar, stoves | 12/12 | 12/16 | 2,500 ⁷ | 725,000 |
| Mali | solar, mini-grid | 01/13 | 12/17 | 3,000 | 100,000 |
| Nepal | stoves, hydro, grid | 05/09 | 06/18 | 6,965 | 399,337 |
| Peru | solar (SHS & picoPV), stoves, grid, SWH-RBF, stoves-RBF | 06/09 | 06/18 | 16,390 | 1,206,500 |
| Rwanda | solar, biogas, hydro, solar-RBF, mini-grid-RBF | 10/09 | 06/18 | 15,490 | 1,028,634 |
| Vietnam | biogas | 07/13 | 06/17 | 3,740 | 275,000 |

⁷ EUR 500,000 might be added pending a contribution from Irish Aid.

Table C.2: Country activities intended to **be extended** without up-scaling

| Country | Activities | Project Duration | | | Funding | Planned outcomes on HH level |
|-------------------|---------------------|------------------|---------|---------|--------------|------------------------------|
| | | start | old end | new end | in EUR 1,000 | in persons |
| Ghana | solar, stoves, grid | 01/10 | 05/16 | 12/16 | 3,150 | 1,200 (+ 1,180 SMEs) |
| Madagascar | stoves | 12/12 | 06/16 | 12/16 | 300 | 47,500 |

Table C.3: Country activities intended to be **scaled up** (bridge financing until end or second half of 2016)

| Country | Activities | Project Duration | | Funding in EUR 1,000 | | Planned outcomes on HH level in persons | |
|-------------------|--------------------------|------------------|-------|----------------------|---------------------|-----------------------------------------|------------------------|
| | | start | end | old funding | new funding | old target | new target |
| Bangladesh | solar, stoves, solar-RBF | 06/09 | 06/17 | 21,214 ⁸ | 22,714 ⁷ | 5,738,255 | 5,800,000 |
| Benin | stoves | 10/09 | 12/17 | 4,457 ⁹ | 5,257 ⁸ | 800,000 ¹⁰ | 1,000,000 ⁹ |
| Tanzania | stoves, solar-RBF | 12/12 | 06/17 | 2,041 | 2,571 | 226,970 | 245,000 |

Table C.4: Country activities intended to be **scaled up and extended** (bridge financing until end or second half of 2016)

| Country | Activities | Project duration | | | Funding in EUR 1,000 | | Planned outcomes on HH level in persons | |
|---------------------|--------------------------------------|------------------|---------|---------------------|----------------------------|----------------------------|-----------------------------------------|------------------------|
| | | start | old end | new end | old funding | new funding | old target | new target |
| Bolivia | solar, stoves, grid | 10/09 | 06/16 | 12/16 | 11,400 | 13,000 | 637,000 | 730,000 |
| Burkina Faso | stoves | 10/09 | 06/16 | 03/17 | 4,985 ¹¹ | 5,785 ¹⁰ | 800,000 ⁹ | 1,000,000 ⁹ |
| Cambodia | biogas | 12/12 | 06/16 | 12/16 | 2,000 | 2,300 | 58,515 | 60,000 |
| Ethiopia | solar, grid stoves, hydro, stove-RBF | 01/10 | 06/17 | 06/18 ₁₂ | 18,137 ¹³ | 19,137 ¹² | 1,562,750 | 1,612,750 |
| Indonesia | biogas | 12/12 | 12/15 | 12/16 | 1,150 | 1,500 | 20,000 | 25,000 |
| Mozambique | solar, stoves, hydro, grid | 10/09 | 06/16 | 12/16 | 10,800 | 12,500 | 321,000 | 420,000 |
| Senegal | solar, stoves, mini-grid | 04/09 | 06/16 | 03/17 | up to 13,401 ¹⁴ | up to 14,201 ¹³ | 865,000 ⁹ | 1,000,000 ⁹ |
| Uganda | stoves, SHS, picoPV, hydro, grid | 04/09 | 03/16 | 12/16 | 8,000 | 9,250 | 534,000 | 534,000 ¹⁵ |

⁸ Including EUR 3.2 million earmarked for solar lanterns .

⁹ Including up to EUR 456,790 contribution of EU to ProCEAO Benin.

¹⁰ Not including the targets of the contribution of EU to ProCEAO.

¹¹ Including up to EUR 485,385 contribution of EU to ProCEAO Benin

¹² Extension is dependent on actual provision of budget by Irish Aid.

¹³ Out of the total budget, EUR 1,100,000 for ICS dissemination is only tentatively committed by Irish Aid.

¹⁴ Including EU co-financing budget: PASES up to EUR 2,370,000, ProCEAO Senegal up to EUR 531,354.

¹⁵ The target remains the same. The reason is an unrealistic planning in the past proposal under different conditions, which cannot be met with the current market based approach.

Table C.5: Regional activities as additional projects (RBF 3)

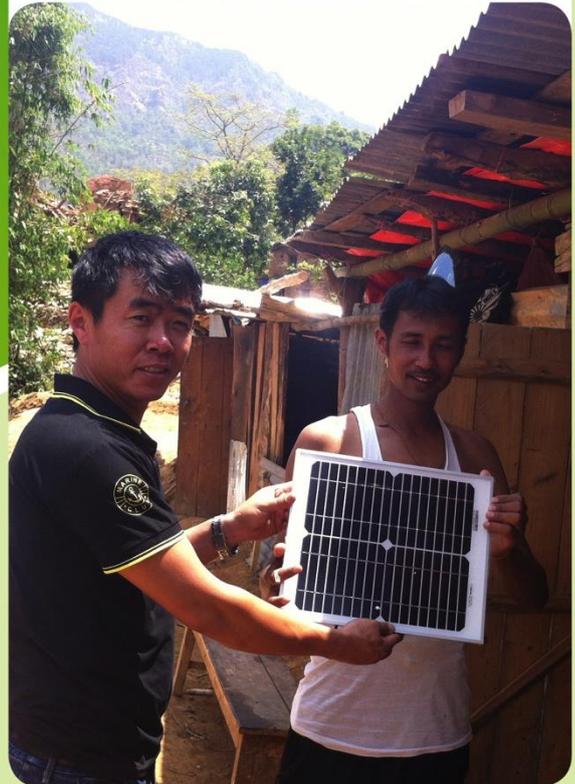
| Country | Activities | Project duration | | Funding | Planned outcomes on HH level |
|-----------------------------------------|----------------|------------------|-------|--------------|------------------------------|
| | | start | end | in EUR 1,000 | in persons |
| Mekong (Cambodia, Laos, Vietnam) | stoves | 03/15 | 02/19 | 4,096 | 600,726 |
| Kenya, Tanzania, Uganda | biogas | 03/15 | 02/19 | 3,870 | 128,940 |
| Malawi, Mozambique | stoves | 03/15 | 02/19 | 1,258 | 640,000 |
| Bangladesh, Kenya | off-grid solar | 03/15 | 02/19 | 4,110 | 1,111,200 |
| Mozambique, Uganda | grid | 03/15 | 02/19 | 4,421 | 200,000 |

Table C.6: EnDev RBF portfolio in three tranches and their budgets

| Country | Title | RBF budget in EUR |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------|
| Tranche 1 (approved) | | |
| Benin | Three Off-grid PV market segments to the next level | 3,060,000 |
| Ethiopia | Improved Cookstoves | 1,542,000 |
| Rwanda | Sustainable Market Creation for Solar Lighting | 3,400,000 |
| Rwanda | Sustainable Market Creation for Renewable Energy Village Grids | 1,891,000 |
| Tanzania | Rural Market Development for Solar picoPV, Lake Zone | 1,541,000 |
| Bangladesh | Output-based picoPV System Development | 3,214,000 |
| Vietnam | Creating a Market Driven Biogas Sector | 3,740,000 |
| Tranche 2 (approved) | | |
| Kenya | Building sustainable and affordable credit lines for small systems in rural areas | 2,800,000 |
| Kenya | Market creation for private sector operated mini-grids | 2,075,000 |
| Kenya | Higher Tier Cookstove Market Acceleration Project | 2,060,000 |
| Nepal | Sustainable Hood-stove Market | 1,675,000 |
| Peru | Getting to universal access in thermal energy services in Peru | 2,040,000 |
| Tranche 3 (approved) | | |
| Cambodia, Laos, Vietnam | Market Acceleration of Advanced Clean Cookstoves in the Greater Mekong Sub-region | 4,096,000 |
| Kenya, Tanzania, Uganda | Biogas Business Boost Benefitting Farmers (4B-F) | 3,870,000 |
| Malawi, Mozambique | Access to modern cooking energy for poor and vulnerable groups in Mozambique and Malawi | 1,258,000 |
| Bangladesh, Kenya | Accelerate the uptake of off-grid solar technologies with results-based financing | 4,110,000 |
| Mozambique, Uganda | Grid Densification Challenge Fund | 4,421,000 |
| Evaluation | | |
| Additional funds reserved for accompanying evaluation of the RBF facility (RBF1-3) | | 1,027,475 |
| Preparation and Knowledge | | |
| Preparation and Knowledge Budget RBF 1-3 | | 1,029,472 |
| Sum | | 48,849,947 |



Nepal: This solar panel was installed at a temporary shelter in a village named Pipaldanda of Sindhupalchowk district, which was heavily affected from the earthquake of 25th April 2015



Vietnam: A results-based finance mechanism for biogas enterprises gives the incentive to construct biogas digester like this one.



Mozambique: Potter fitting the ceramic combustion chamber in a Mabaula charcoal stove



Peru: Families with an improved cookstoves like this one in Cajamarca save money – they spend only between 7 and 12 soles for firewood; those with traditional stoves spend between 23 to 26 soles monthly.

D. Overview about planned general EnDev activities in 2016

Cooperation with other organisations and initiatives

In 2016 EnDev will continue to contribute actively to the **Sustainable Energy for All Initiative (SE4ALL)**. Staff members of EnDev will participate in relevant conferences and working groups and provide background information and experiences of the programmes to delegates of the donor countries of the EnDev partnership. We will especially present our approaches to develop off-grid energy markets, and to monitor access to electricity and cooking at different tiers. In some countries surveys will be carried out based on the methodology developed in the context of the Global Tracking Framework. EnDev will also present its experiences with the multi-tier system for cooking and contribute to the refinement and operationalization of the health indicator. EnDev will also actively be involved in events and campaigns that are linked to the UN initiative and support action plans on country level.

EnDev closely cooperates with relevant development measures on regional and bilateral level, particularly with bilateral energy programmes of EnDev donors in the individual partner countries. In some cases these bilateral project are part of a wider initiative such as **Energy+**, **Power Africa**, or **Energy Africa**. EnDev measures will be aligned with these measures and especially complement policy advice activities by on the ground implementation activities.

Details of the cooperation will be agreed at country level, but generally consists either of regular information exchange, agreements on coordinated or joint activities.

EnDev is regularly exchanging information with the EU-Energy Initiative Partnership Dialogue Facility (EUEI-PDF) and supports the Africa-EU Renewable Energy Cooperation Programme (RECP) as well as the EU-Africa Energy Partnership (AEEP).

EnDev is cooperating with several **World Bank** Group programmes on national as well as on international level including the **Lighting Africa/Lighting Global** initiative. EnDev is currently coordinating several country projects such as Bangladesh, Ethiopia, Kenya, and Tanzania with Lighting Global. In addition to joint country activities, EnDev will contribute actively to impact studies about pico solar systems and the conceptual discussions how to achieve the last mile and develop sustainable business concepts for solar companies and retailers. In addition, EnDev is supporting the **Global Off-Grid Lighting Association (GOGLA)** regarding quality assurance activities, the general strategy and specific conceptual direction of the association.

EnDev is discussing with **ESMAP/World Bank** a joint project proposal to the Green Climate Fund (GCF). The joint project would target at strengthening market development for cooking technologies in at least 5 selected countries and enhance coordination between main actors in the cooking sector. Funding from GCF or similar international funds would allow a diversification of EnDev's financing strategy, to upscale its activities beyond a "business as usual scenario" while reducing its vulnerability to core funding gaps.

EnDev actively contributes to the **Global Alliance for Clean Cookstoves**. EnDev experts are participating in different working groups of the alliance including the group developing ISO norms for quality and testing of stoves. In addition, EnDev participates in relevant conference and international discussions on how to develop sustainable markets for stoves.

EnDev is also in close contact with **WHO**, the World Bank and GACC to exchange concepts and findings to define health indicators for cooking system and to reduce indoor air pollution. EnDev is regularly reporting its outcome figures to GACC and is currently one of the main contributors to the GACC figures on global access to clean cooking. On country level EnDev is supporting test and quality laboratories equipped by GACC. In addition, EnDev is participating in creating and strengthening clean cooking associations and in developing country action plans.

EnDev New UK Minister of State Grant Shapps visits EnDev Tanzania

On 21 May 2015, after being in office for only one week, the new DFID Minister of State Grant Shapps honoured EnDev Tanzania with a visit. EnDev Tanzania promotes improved cookstoves and small solar systems in Tanzania’s Lake Zone. The country programme is implemented by SNV in cooperation with GIZ.

Grant Shapps accompanied by his team, EnDev Tanzania Programme Manager Josh Sebastian (SNV), EnDev Regional Coordinator Marco Hüls (GIZ) as well as representatives of EnDev’s private sector partner Off Grid-Electric. The mission visited the homes of Ms. Elizabeth Bukwimba and two of her neighbours in Magu, a village half way between Lake Victoria and Serengeti National Park. Elizabeth is one of the more than 20,000 people to date who have gained access to electricity through EnDev Tanzania’s solar component.



In the solar component, EnDev Tanzania aims to improve market access to small devices for rural households in the Lake Zone in North Western Tanzania through the use of a results-based financing (RBF) mechanism that incentivises solar companies to reach out to rural customers by creating a network of sales agents. Off Grid-Electric, whose rural agents installed a pay-as-you go solar system at Elizabeth’s house, is one of the companies participating in the RBF project.

Owning a solar system himself at his UK home, Grant Shapps immediately engaged in an exchange of experiences with Elizabeth. “I am now paying the same amount I used to pay for kerosene, but have much more light”, Elizabeth explained. “In the beginning I thought my grandchildren would have to help me with the solar system, but it is very easy to use. My son can even top up my solar credit from far away in Dar es Salaam”, she added.



After being shown around the house, Grant Shapps thanked Elizabeth for her hospitality by offering her a Matawi cookstove. The Matawi has been developed by EnDev Tanzania and is now being produced and marketed by local entrepreneurs in the Lake Zone. At Elizabeth Mukwimba’s house, the new stove is replacing a traditional three-stone fire. Thus Elizabeth and her grandchildren now join the more than 35,000 people gaining access to cleaner cooking facilities through EnDev Tanzania.

Impact Monitoring and Evaluation

In 2016, EnDev will carry out several surveys (baseline, status of energy access and impact) based on the tablet application which has been developed in 2014 and 2015 in cooperation with the Global Tracking Framework team of the World Bank. The surveys shall also provide more solid evidence about the validity of reported figures: to what extent are reported and survey data consistent. In the last months, EnDev has been evaluating the monitoring and verification methodology of all country projects which has increased the accurateness of reported figures. However, the size of the applied adjustment factors is still largely based on assumptions not verified by field data. The planned surveys shall close this gap. The surveys will also complement country studies on impacts and the sustainability of achieved outcomes.

The broader data base will allow a more comprehensive assessment of strengths and weaknesses of country measures and improve the transparency of upscaling decisions. The medium term objective is to gradually introduce annual surveys within all EnDev countries providing regular data as basis for conceptual and strategic decisions.

The evaluation of the RBF component is ongoing and will include a detailed analysis of two country projects. The impact study on job creation in the value chains of improved cookstove and picoPV will be finalized and main findings incorporated into the monitoring system. Special emphasis will be given to the gender aspects of job creation and productive use of energy.

EnDev has started to collect field data about traditional lighting sources, especially the question whether kerosene is still the major source for lighting. Data collection will continue in 2016 and results be presented end of next year. For the time being, EnDev is assuming that on average only one kerosene lantern is replaced by solar lanterns instead of two (typically used in climate mitigation calculation) when assessing CO₂ emission reductions of solar lanterns.

EnDev will continue to look for collaboration with academia and try to leverage funds in order to implement larger and more valid field studies. EnDev will explore specifically opportunities for cooperating with the health sector. However, efforts in this regard have not been very successful in 2015.

Public relation activities

EnDev has at present no plans for any special public relation actions in 2016. However, EnDev will continue to organise side events and participate actively in upcoming conferences and international meetings of SE4ALL and other initiatives dealing with energy access and related topics.

EnDev will develop updated narratives for the nexus of energy access and climate change, gender, green growth, and health, in support of both the influencing of global discussions and EnDev's financing strategy.



*Bolivia: In the municipio Cabezas, Santa Cruz, this home got a newly installed light and an improved cookstove **Malena**.*



Mozambique: Solar energy shop in Sofala province supported by EnDev partner ADEL



Benin: The impact study of ProCEAO revealed that the knowledge about ICS by households has risen from 10% to 74%; ICS penetration rate has increased from below 2 % before the intervention to over 26% today.



Bangladesh: EnDev is supporting around 5,000 sanitary shops to build, promote and sell improved cookstoves with chimney.



Indonesia: The communication hotline system "Energi Desa" is operated by a social enterprise and has 768 registered users. So far, over 17,000 SMS were exchanged. It currently serves also as a hotline to assist the villagers to solve technical and administrative problems with their mini-grids.



Uganda: "Good stove - Better Cooking" is the national quality branding for improved cookstoves, developed and supported by EnDev.



Uganda: Road shows for promotion for improved cookstoves

Abbreviations

| | |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ABERME | Agence Béninoise d'Electrification Rurale et de Maîtrise d'Énergie / Agency for rural electrification and energy Control, Benin |
| ADEL | Agenda de Desenvolvimento Econômico Local |
| ADES | Association pour le Développement de l'Énergie Solaire, Switzerland |
| ADLP | GIZ Decentralisation and Poverty Reduction Program, Burundi |
| AEEP | Second High Level Meeting of the Africa-EU Energy Partnership |
| AEME | Agence pour l'Economie et la Maîtrise de l'Énergie, Senegal |
| AEPC | Alternative Energy Promotion Centre, Nepal |
| AES | African Energy Saving Stoves and Construction Company |
| AFD | Agence Française de Développement/ French Development Agency |
| AGROIDEAS | Program for Competitiveness from the Ministry of Agriculture, Peru |
| AGSI | Association of Ghana Solar Industries |
| AMADER | Agence Malienne pour le Développement de l'Énergie Domestique et de l'Électrification Rurale, Malian Agency for Household Energy and Rural Electrification, Mali |
| ANER | Agence Nationale des Énergies Renouvelables, National Agency for Promotion of Renewable Energy, Senegal |
| ASDDG | Action Sud Développement Durable Genève, Madagascar |
| ASER | Direction de l'Énergie, Agence Sénégalaise de l'Électrification Rurale, Senegalese Rural Electrification Agency |
| AVSI | Associazione Volontari per il Servizio Internazionale, NGO |
| BBK | Barclays Bank of Kenya |
| BCCs | biogas construction companies |
| BCSs | battery charging stations |
| BECT | Biomass and Energy Certification and Test Center, Mozambique |
| BMZ | the German Federal Ministry for Economic Cooperation and Development |
| BOO | build-own-operate concession model |
| BOOT | build-own-operate-transfer model |
| BTC | Belgian Technical Cooperation |
| C-SIREA | Capacity for a Successful Implementation of the Renewable Energy Act, Ghana |
| CB | Chitetezo Mbaula, Malawi |
| CBOs | community based organisations |
| CDM | Clean Development Mechanism |
| CEFE | Competency Based Economies Formation of Enterprises |
| CFL | compact fluorescent lamp |
| CO₂e | CO ₂ equivalent |
| COOPI | Cooperazione Internazionale, Italy |
| COP | community of practice |
| CPO | Construction Partner Organization |
| CREE | Community Rural Electrification Entities, Nepal |
| CREEC | Centre for Research in Energy and Energy Conservation |
| CREF | Central Renewable Energy Fund, Nepal |
| CU | Concern Universal, Malawi |
| DETA | Development Oriented Emergency and Transitional Aid (GIZ), Liberia |
| DEZA / SDC | the Swiss Agency for Development and Cooperation |
| DFAT | the Australian Department of Foreign Affairs and Trade |
| DFID | the UK Department for International Development |

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| DGHER | General Directorate of Water and Rural Energies, Burundi |
| DGNREEC / EBRKE | Directorate General for New and Renewable Energy and Energy Conservation, Indonesia |
| DIPREME | Direcções Provinciais de Energia/ Provincial Directorates of Energy, Mozambique |
| DNCT | Direction Nationale de Collectivités Territoriales, Mali |
| ECG | Electricity Company of Ghana |
| EdM | Electricidade de Moçambique/ Energy Public Utility, Mozambique |
| EIAs | environmental impact assessments |
| ELCOM | Electrification COMMunale, Mali |
| EnDev | Energising Development programme |
| Energi Desa | SMS communication system, Indonesia |
| EPP | Emergency Power Programme, USAID, Liberia |
| ERILs | electrifying interested rural villages in mini-concessions |
| ERSEN | The Rural Electrification Senegal Programme |
| ERT | Energy for Rural Transformation II Programme, financed by World Bank, Uganda |
| ESME | Energy SME programme, WB, Rwanda |
| ESPs | rural energy service providers |
| EU-ACP EF | EU Africa-Caribbean-Pacific Energy facility |
| EUEI-PDF | European Union Energy Initiative-Partnership Dialogue Facility |
| FABEN | Foyers Améliorés au Bénin/ Improved cookstoves in Benin |
| FAFIDESS | , a microfinance institution, Guatemala |
| FASEN | Foyers Améliorés au Sénégal/ Improved cookstoves in Senegal |
| FfW | Foundation for Women, Liberia |
| FiT | feed in tariff |
| FOCAEP | Central American Fund for Access to Sustainable Energy and Poverty Reduction |
| FONCODES | Programme “Haku Wiñay/Noa Jayatai” of the Peruvian Social Fund, Peru |
| FSD | financial sector development |
| FSTE | Fond de Solidarité des Travailleurs de l’Enseignement, Literacy Workers Solidarity Fund, Burundi |
| FUNAE | Fundo de Energia, Mozambique |
| GACC | Global Alliance for Clean Cookstoves |
| GBE | Green Bio Energy |
| GCF | Green Climate Fund |
| GEDAP | Ghana Energy Development and Access Project |
| GIZ | Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH |
| HH | households |
| HIVOS | Humanistisch Instituut voor Ontwikkelingssamenwerking |
| ICS | improved cookstove |
| IDBP | Indonesia Domestic Biogas Programme |
| IDCOL | Infrastructure Development Company Limited |
| IFC | International Finance Cooperation |
| IFC-LG | International Finance Corporation - Lighting Global |
| IFDC | International Fertilizer Development Center |
| ILF | International Lifeline Fund, stove producers in Uganda |
| IRSAT | Institut de Recherche en Sciences Appliquées et de Technologie, Burkina Faso |
| ISAK | the Improved Stoves Association of Kenya |
| IVA | independent verification agent |
| IWM | improved water mills |
| KEREA | Kenya Renewable Energy Association |

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| KIRDI | Kenya Industrial Research and Development Institute |
| KKP | Ministry of Marine Affairs and Fisheries, Indonesia |
| KPI | key performance indicator |
| KPT | kitchen performance test |
| KUKM | Ministry of Cooperatives and Small and Medium Enterprises, Indonesia |
| LCASP | Low Carbon Agricultural Support Project, Vietnam |
| LDC | least developed countries |
| LESEP | Liberia Electricity Enhancement Project, World Bank, Liberia |
| LFSN | Lango Food Security and Nutrition Cluster, Uganda |
| LG | Lighting Global |
| LIFSAP | Livestock Competitiveness and Food Safety Project, financed by the World Bank, Vietnam |
| LIZ | light industrial zones |
| LLL | Lighting Lives in Liberia, World Bank |
| LMEs | last mile entrepreneurs |
| LWF | Lutheran World Federation, Uganda |
| M&V | monitoring and verification |
| MAFF | Ministry of Agriculture, Forestry and Fisheries, Cambodia |
| MARD | Ministry of the Agriculture and Rural Development, Vietnam |
| MATCL | Ministere de l'Administration Territoriale et des Collectives Locales, Malian Ministry of Territorial Administration and Local Government, Mali |
| MEDER | Ministère en charge de l'Energie, Ministry of Energy, Senegal |
| MEM | Ministry of Energy and Mines, Burundi |
| MEM | Ministry of Energy and Mines, Nicaragua |
| MEMD | Ministry of Energy and Mineral Development, Uganda |
| MEMR | Ministry of Energy and Mineral Resources, Indonesia |
| MEMR / ESDM | Ministry of Energy and Mineral Resources, Indonesia |
| MERMEDER | Ministre de l'Energie, des Recherches Pétrolières et Minières, de l'Eau et du Développement des Energies Renouvelables/ Ministry of Energy, Oil and Mineral Research, Water and Renewable Energy Development, Benin |
| MERVA | Message Entry and Routing with Interface to Various Applications |
| MESPT | Micro Enterprise Support Programme Trust, Kenya |
| MFA / DGIS | Netherlands Ministry of Foreign Affairs Directorate-General for International Cooperation |
| MFA-NOR | the Norwegian Ministry of Foreign Affairs |
| MFI | micro finance institution |
| MFI s | micro finance institutions |
| MHDF | Micro Hydro Debt Fund, Nepal |
| MHE | Ministry for Hydrocarbons and Energy, Bolivia |
| MHP | micro hydropower |
| MHPP | micro hydropower plant |
| MIDIS | Ministry of Development and Social Inclusion, Peru |
| MINEM | Ministry of Energy and Mines |
| MININFRA | Ministry of Infrastructure, Rwanda |
| MNP | Madagascar National Parks |
| MOAP | Market-Oriented Agriculture Programme, Ghana |
| MoEP | Ministry of Energy and Petroleum, Kenya |
| MoFA | Ministry of Food and Agriculture, Ghana |

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| MoHA | Ministry of Home Affairs, Indonesia |
| MoP | Ministry of Power, Ghana |
| MoSTE | Ministry of Science, Technology and Environment, Nepal |
| MoU | Memorandum of Understanding |
| MoWIE | Ministry of Water, Irrigation and Energy, Ethiopia |
| MSP | mini-grid service package |
| MVCS | Ministry of Housing, Construction and Sanitation |
| NACEUN | National Association of Community Electricity Users Nepal |
| NBP | National Biodigester Programme, Cambodia |
| NBSSI | National Board for Small Scale Industries, Ghana |
| NCSC | National Cookstoves Steering Committee, Malawi |
| NDBP | National Domestic Biogas Programme, Rwanda |
| NEA | Nepal Electricity Authority |
| NEDCo | Northern Electricity Distribution Company, Ghana |
| NEEP | Nepal Energy Efficiency Programme |
| NQI | National Quality Infrastructure Programme, Ethiopia |
| NRREP | National Rural and Renewable Energy Programme, Nepal |
| PADRE | Programme d'Appui à la Décentralisation et à la Réforme de l'Etat, Mali |
| PASES | Projet d'accès aux services électriques des localités de petite taille dans la région de Sédhiou / EU-co-funded electrification project, Senegal |
| PAYGo | pay-as-you-go model |
| PDP | Project Development Programme, BMWi/GIZ, Mozambique |
| PER | Program for Rural Electrification |
| PERACOD | Promotion of Renewable Energies, Rural Electrification and Sustainable Supply of Household fuels, Senegal |
| PEVD | Program Electricity to live with dignity, Bolivia |
| picoPV | pico photo voltaic |
| PMU | Biogas Project Management Unit, Vietnam |
| PPA | power purchase agreement |
| PPP | public private partnership |
| ProCEAO | Programme pour l'Énergie de Cuisson économique en Afrique de l'Ouest/ Cooking energy in East-Africa |
| ProEcon | Economic Development Programme, GIZ/BMZ, Mozambique |
| ProEducação | Education Programme, Mozambique |
| PSED | BMZ Programme for Sustainable Economic Development, Ghana |
| PU | productive use of energy |
| PVTMA | photovoltaic targeted market approach |
| QSEAP | Quality and Safety Enhancement of Agricultural Products and Biogas Development Project, Asian Development Bank |
| RBF | results-based finance |
| REA | Rural Electrification Agency, Uganda |
| REFIT | Renewable Energy Feed-in Tariff |
| REG | Rwanda Energy Group |
| REP | Rural Enterprise Programme, Ghana |
| RERL | Renewable Energy for Rural Livelihood, UNEP and WB, Nepal |
| RREA | Rural Renewable Energy Agency, Liberia |
| RURA | Rwanda Utilities Regulatory Agency |
| RVO | Rijksdienst voor Ondernemend Nederland |

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| SACCOs | savings and credit cooperative societies |
| SBEE | Société Béninoise de l'énergie électrique/ Benin Electric Energy Society, Benin |
| SDR-ASAL | Strengthening Drought Resilience of the Pastoral and Agro-Pastoral Population in the Lowlands of Ethiopia |
| SE4ALL | Sustainable Energy for All initiative |
| SHS | solar home system |
| SI | social institutions |
| SLM | Sustainable Land Management Programme, Ethiopia |
| SME | small and medium enterprise |
| SMEREF | SME Renewable Energy Development Fund, Rwanda |
| SMSS | solar multi service stations |
| SNV | Stichting Nederlandse Vrijwilligers / Netherlands Development Organisation |
| SSHS | small solar home systems |
| STEP | Sustainable Training and Education Programme, Ethiopia |
| SWH | solar water heaters |
| TIB | Tanzania Investment Bank |
| TICS | Tanzania Improved Cook Stove programme |
| TTIs | technical training institutions |
| UEM | Eduardo Mondlane University, Mozambique |
| UNFCCC | United Nations Framework Convention on Climate Change |
| UNICEF | United Nations Children's Fund |
| UOB | Urwego Opportunity Bank |
| VGS | voluntary gold standard emission reduction certificates |
| VMEEA | Vice Ministry for Electricity and Renewable Energy, Bolivia |
| VMT | village management teams |
| WOCAN | Accelerating Investments in Women through Certification |
| YRE | Yayasan Rumah Energi, biogas association in Indonesia |

Funded by:



Energising Development

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH
Registered offices Bonn and Eschborn, Germany

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