Annual Planning 2017

Energising Development – Phase 2

energising development

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endev

Key achievements since 2005

Energy access for

15.8 million

people accomplished

12.2 million

household members with improved cooking solutions

3.6 million

household members with electricity

Key achievements since 2005

1.8 million t of CO_2 saved per year – equivalent to planting of more than 4 million trees

A total installed power of **51,2 MW** with renewable energies

37,000 small and medium enterprises with a modern form of energy for productive uses

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

18,100 social institutions with a modern form of energy:
among them 9,500 schools and 1,050 health centres

6.3 million men, women and children with drastically reduced exposure to indoor air pollution

Broader impacts and indirect effects of EnDev

Toghether with others, EnDev has supported new access to sustainable energy for at least:

60 million people

EnDev has contributed to transitional changes in the energy sector towards attractive markets for renewable energy technologies

EnDev pushes markets outside its project areas

Large numbers of products introduced and promoted by EnDev are increasingly sold outside the projects areas:

- 30% of picoPV sales in Malawi
- 300% solar water heaters in urban Peru
- 50% of improved stoves in Bangladesh

in addition to its direct outcomes

EnDev pilots inspire larger programmes

- new RBF schemes and funds like a 120 million USD energy facility in Tanzania
- new credit fund for rural electrification in Nepal

EnDev inspires new policies

- **Indonesia**: a new national programme for domestic biogas
- **Peru**: new national standards for grid connections
- **Several African countries:** new tariff regulations for mini-grids, import duty exemptions for high quality solar products

A. EnDev in 2017 – trends and challenges

In the first half of 2016, EnDev facilitated sustainable access to modern energy services for additional **370,000** people, increasing the total number of people benefiting from the programme to **15,850,000**. 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 2016 and in 2017 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 reach around 17 million people for the period 2009 – 2017.

End of 2016 two additional donors may support EnDev activities. The Government of Denmark is considering to provide 500,000 EUR to strengthen the Central Renewable Energy Fund (CREF), one of the main components of the National Rural and Renewable Energy Programme of Nepal, where EnDev is involved. The Korea Foundation for International Healthcare will make available a grant of 1 million EUR to support electrification of health centres in Ethiopia with focus on maternal, neonatal and child health.

Strategic direction of EnDev in 2017

A.1 EnDev's strategy basis

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.

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.

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.

A.2 Strategic directions of the upscaling proposals in 2017

As a part of this Annual Planning 2017, nine projects are proposed for upscaling to the EnDev Governing Board. Financially the upscaling is constrained to minimal business as usual scenarios for country projects nearing their budget depletion. All projects can increase their activities and results when new core funding becomes available. Upscaling proposals from 3 additional projects were postponed until spring 2017 because of still remaining project budgets and the need for further strategy discussions.

The upscaling strategies reflect EnDev's ambitions to reach for inclusive impact, "leaving no one behind", at scale on the country levels, capitalizing on its structures and the experiences gained so far. In particular 3 trends can be observed, continuing on the course set in the updated annual planning 2016. In 2017 these trends will be further strengthened, delivering not only on direct outcomes of the programme but also on indirect results because of improved sector conditions attracting other investors. These indirect effects of EnDev's work already contribute substantially to impact at scale, as illustrated in chapter B.

1. Increasing focus support on entrepreneurs with potential for scale

Several projects in EnDev's portfolio are ready for a next step in market development. Where initially no or only very weak entrepreneurship for energy access, be it cookstoves or solar, was available in rural areas, the capacity development efforts of EnDev and other supporting actors bear fruit. After a (often lengthy) period of basic training and supporting a broad basis of stove producers and

distributers, stoves installers, and solar vendors, the real entrepreneurs with a true potential for growth within that basis can be identified. In these markets EnDev support moves increasingly towards tailor made, performance based support of these entrepreneurs and companies. This support can be both company specific and towards the development of the larger enabling environment. Where this could already be observed is in EnDev stove programs in Uganda, Tanzania and Benin. The current upscaling proposals for Burkina Faso, Kenya and Senegal adapt their strategy to further professionalize and where possible industrialize the production and distribution of ICS. For solar similar strategy considerations are followed, for instance in Kenya by connecting rural Last Mile Entrepreneurs (LME's) in the solar sector to import and retail companies in urban areas, and to industrial ICS producers at national level. It is envisaged that over time these small rural companies grow to a level where they become eligible for e.g. EnDev's RBF facility or the countries' financial sector.

2. Cooperate actively with large co-investors in the sectors

EnDev actively discusses cooperation with bi- and multilateral investors entering the (sub)sectors it operates in a number of countries, including several of the countries suggested for upscaling in this annual planning. Cooperation with the World Bank Group seems especially promising. In Rwanda EnDev and WB explore cooperation to support GoR in the preparation and implementation of a (50 million USD) SREP financed Rural Energy Fund for solar and mini-grids, drawing on EnDev's vast experience in the Rwandese rural energy sector in general and its cooperation with the private sector and RBF in particular. In Mali explorative discussions have been initiated between EnDev, WBG and the Dutch DRIVE Infrastructure development program for cooperation in the mini-grid sector as well as in grid extension/densification comprising investments of over 50 million USD. The ongoing EnDev-WBG-GACC cooperation on a joint proposal to the Green Climate Fund for a programmatic clean cooking program is another example of EnDev/WB cooperation. Also other bi- and multilateral development partners seek to build on EnDev's preparatory work in the off grid access sectors, like in Nepal (ADB looking at the grid densification activities of NEA/EnDev), Burkina Faso (where both the German NAMA-facility and the FEI[1] prepare multimillion investments in the clean cooking sector), Indonesia (the Millennium Challenge Corporation co-financing EnDev's activities and GoI investing substantial amounts in the biogas sector on the basis of EnDev's quality criteria and assurance structures). Lately cooperation under AREI is explored.

3. Stronger engagement in policy development and sector governance

Bringing markets and sectors to scale means EnDev increasingly complements its field work and bottom-up activities with activities aimed at improving the enabling environment, including policy and regulations development, stakeholder organization and advocacy mechanisms and access to finance. With additional earmarked funding from the Dutch government EnDev provides sector support to the clean cooking sectors in Bangladesh, Ghana, Kenya and Uganda. The support aims to strengthen the business model and positions of the respective National Alliances for Clean Cookstoves in the countries in their roles as central sector convener and representative, and advocates in policy preparation by the government. Through this support EnDev aims to bring together the most important development partners (often GIZ, SNV, RVO and GACC) involved in clean cooking under a joint sector support strategy. In addition EnDev Kenya also directly interacts with the inter-ministerial committee for clean cooking (under SE4All). County governments in Kenya also approach EnDev to assist in setting up policy and programs for promotion of rural energy access, cooking in particular. In Mali EnDev convenes the "Technical & Financial partners" platform to discuss policy and regulatory issues in the rural electrification sector. The platform exchanges with GoM, private and public actors and advocates for instance mini-grid tariff policy and regulations. In Burkina Faso cooking energy has been set prominently on the SE4All and NDC agenda's and, together with substantial planned investments from the NAMA facility and the FEI fund, triggers the need for

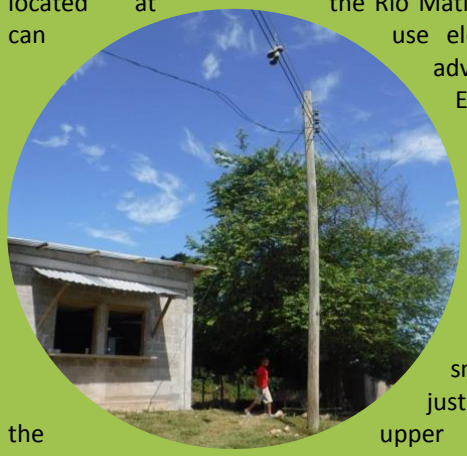
[1] Le Fonds d' Intervention pour L' Environnement, currently financed by Luxembourg and Sweden, managed by BF state institution and supposed to be future fund for all climate and environmental donors.

developing functioning ICS sector governance. Under the proposed upscaling EnDev proposes to support relevant government institutions in this.

Reliable electricity for an isolated Honduran village

The village of Plan Grande on the coast of Honduras is more than ten hours away from the capital and only accessbile via boat. When, in 2009 , the villagers had the oportunity to build their own micro hydropower plant with financial aid from the Small Grants Programme (SGP) of the Global Environment Facility (GEF) and UNDP, and with technical assistance from EnDev and the Honduran Foundation for Agricultural Research (FHIA) they did not hesitate. EnDev contributed the technical design, construction of the grid and training for the operators, and coordinated the whole process.

Today, 85 households and eight social institutions such as schools, a kindergarten, a health centre, a community centre, and churches in Plan Grande benefit from a reliable electricity supply (before, it were 61 households and three social institutions). Their micro hydropower plant is located at the Río Matías, 2.5 kilometres away from the village. For the first time families can use electric household appliances on a regular basis and enjoy the advantages of clean, bright light from electric lamps instead of candles. Especially the fishermen benefit: before they could use refrigerators they had to sell their catch immediately – leaving them de facto without negotiation power on the market.



As the 16.5 kWh electricity generated by the plant did not fully meet the demand, the villagers set up a schedule to optimise energy use: they can use their energy-efficient light bulbs at all times but there are certain times when to watch telenovelas, use the fan or chill food. A sliding pay scale helps run the plant smoothly: in the lower range of power consumption households that just use lamps pay four dollars per month whereas in the upper range those who run a refrigerator, fan, TV, PC and freezer pay 11 dollars a month. The village mayor, Noel Ruíz, explains the long-term success of the power supply as a collective effort of the community that upholds transparency and accountability.

A few kilometres away from Plan Grande, in the village of Quinito, EnDev also helped install a micro hydropower plant. There, EnDev trained a technician named Santos Orlando Puerto to maintain the plant. He has since developed his knowledge and is now active in other parts of the country too. In Plan Grande, Santos has maintained the plant and trained the operators. In cooperation with EnDev he is also involved in the construction of a new hydropower plant in El Porvenir.

A.3 EnDev's refugee activities in 2017

The 2016 spring EnDev governing board mandated the program to develop and implement activities in the field of refugees and internally displaced persons. Since then EnDev management has followed-up on the leads that were identified in the board paper on refugees that was presented during that meeting. This concerns the design of pilot approaches in Kenya and Uganda in parallel to the acquisition of funds for their implementation. Current core budget constraints prevent

mainstreaming refugee components in the country components, as it would add considerably to the costs of program infrastructure on the ground. In Uganda DFID is in the process of developing a business case to support the country's humanitarian agenda, including an energy and climate component to support the Uganda SAFE strategy. DFID has expressed its initial interest in EnDev's approach and infrastructure in the country. Although still early in the discussion, EnDev proposes to allocate maximum 300.000 Euro's from management budget to prepare and implement a pilot provided agreement is reached with DFID Uganda about follow-up (and possibly leverage). For Kenya the Norwegian MFA was approached and found willing to provide a 1 million USD contribution to EnDev core budget with soft earmarking for refugees. On the basis of this further design of the approach in Kenya is ongoing, targeting Kakuma camp and –if political circumstances are conducive- Dadaab. The approach will be step wise, starting with a baseline assessment of the current situation and the stakeholder landscape, followed by clearly defined and targeted pilot(s). Crucial issue to address is to avoid conflicting approaches in the camp and host community areas through consultation of UNHCR and other relief organizations involved in energy (or planning to become involved). EnDev will seek cooperation with the GIZ-SIF program and the Moving Energy Initiative, in Kenya represented by Energy4Impact (formerly GVEP), in these consultations and the subsequent (if deemed feasible) pilot(s). If results are positive, (parts of the) pilots will move into full implementation where possible leveraging EnDev funds with that of others. EnDev's core values of (as much as possible) market-based approaches, sustainability and impact at scale will be followed in the design and implementation. Nevertheless it may be expected that EnDev's high benchmarks, inc. on cost-efficiency, will not be met under the prevailing conditions in the camps. EnDev management proposes to initially allocate the Norwegian contribution for the refugee activities in Kenya but in case baseline or pilot phases are not successful (enough) to reallocate to refugee activities in other countries or back to EnDev core budget.

Past or ongoing EnDev activities in the country projects often concern the delivery (through EnDev supported stove producers) of stoves to NGO's and relief organization in refugee camps, mostly distributed for free. That way for instance 2,000 factory stoves were distributed in Northern Uganda (8.000 more currently planned) and Ethiopia (51,000 Tikikil stoves since 2009, recently 3,000 more). Also in Bangladesh stoves have been sold to refugee camps. Within camps some 100 refugees were trained as stove producers in Burkina Faso, Kenya (inc production centers in Dadaab and Kakuma), Uganda. Most of their production is however taken by NGO's distributing them for free, underlining again the challenge of a market based approach in refugee situations and the critical need for alignment with humanitarian organizations. As a positive sign however the observation in Burkina Faso was that, in spite of free handouts, no stoves seem to be on-sold on the local markets, indicating appreciation of and need for ICS with the refugees. During the Ebola crisis solar lamps were distributed to app. 12,000 groups and individuals in Liberia, Sierra Leone and Guinee, in addition to 300 lighting and refrigeration systems to schools and clinics, as efforts for support in stoves and solar were undertaken after the Nepal earthquake in 2015. In 2017, a solar component for the Gao conflict area is included in the upscaling proposal for Mali, whereas the RBF for stoves in Mozambique aims to target flooding displaced people.

A.4 Inclusive business development

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. 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. 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. Many of the jobs created with help of EnDev are within the energy sector itself,

some are constrained to providing services (shops, bars, within the communities). Others, however, reach out beyond the communities producing agro or handicraft products that are sold outside the community economy and link the communities with larger markets. Examples already present in the EnDev portfolio are solar powered irrigation (Ghana), crop processing (Liberia) and inspection (Bolivia), milk chilling (Nepal), and bakeries (Uganda). EnDev will search for replication of successful approaches in other countries and pilot new productive use concepts to its portfolio. EnDev will explore nexus cooperation with agricultural and food security programs.

A.5 Stepping up engagement with global initiatives

In 2017 EnDev will further increase its engagement with global initiatives. Chapter D provides an overview of EnDev's current and planned engagements. Some of the exchanges and cooperations have been ongoing for years (SE4All, although in transition now, Lighting Global, 1 GTon coalition), others have only emerged quite recently and have not yet reached the implementation stage, like f.i. the NDC's and AREI and EnDev is subsequently still exploring where it can contribute. For more information please refer to chapter D.

Honduras: The micro hydropower plant that supplies Plan Grande, Honduras, with electricity is situated at the Río Matías, 2.5 kilometres away from the village.

Honduras: Also the school in Plan Grande runs on electricity from the micro hydro power plant.

Honduras: In 2016, the village installed a newer, larger turbine to generate more electricity.

Honduras: Technical assessment for the enhancement of the dam wall and the construction of a sand trap in Plan Grande, Honduras.

B. Overview of current status of the EnDev 2 programme

This chapter provides information on energy access outcome, health impacts and CO_2 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-2016, the EnDev partnership comprised 29 projects in 25 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

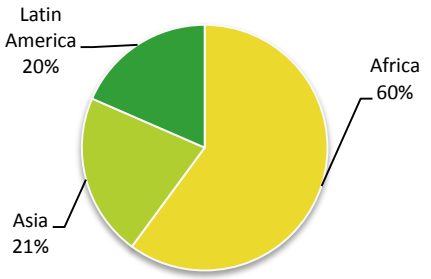
		stoves	biogas	other cooking/ thermal	SHS	picoPV	solar mini-grid	hydro mini-grid	grid	other lighting/ electricity
country projects	Bangladesh	●			●	●				
	Benin	●				●			●	
	Bolivia	●		●	●	●		●	●	
	Burkina Faso	●								
	Burundi[2]	●				●				●
	Cambodia		●							●
	Ethiopia	●			●	●		●		
	Ghana								●	
	Indonesia						●	●		
	Indonesia biogas		●							
	Kenya	●				●			●	
	Liberia[3]	●		●		●	●			
	Madagascar	●								
	Malawi	●				●				
	Mali				●	●	●			●
	Mozambique	●			●	●		●	●	
	Nepal	●						●	●	
	Peru	●		●	●	●			●	
	Rwanda					●		●		
	Senegal	●			●		●		●	
	Tanzania	●				●				
	Uganda	●			●	●		●	●	
	Vietnam		●							
multi-country projects	Bangladesh, Kenya				●[4]					
	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

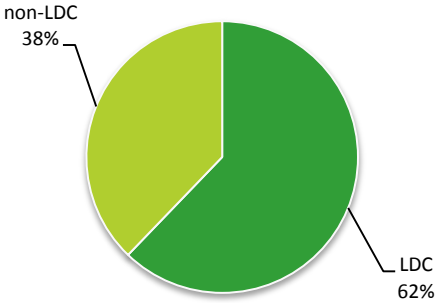
By June 2016, EnDev 2 facilitated sustainable access to modern energy services and technologies for about **10.83 million people**. Of these, 2.73 million people (25%) were connected to the central grid or a mini-grid, or used standalone electric systems. 8.11 million (75%) are now using improved cooking technologies, such as improved firewood and charcoal stoves or biogas plants (figure B.3). In addition, **10,686 social institutions** gained access to electricity or improved cooking systems and **25,168 small and medium enterprises** now have access to a modern form of energy for productive use.

Figure B.1: Funding by region



The focus of the EnDev programme is on Sub-Saharan African countries. Around 60% 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 62% (figure B.2).

Figure B.2: Funding by countries



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.

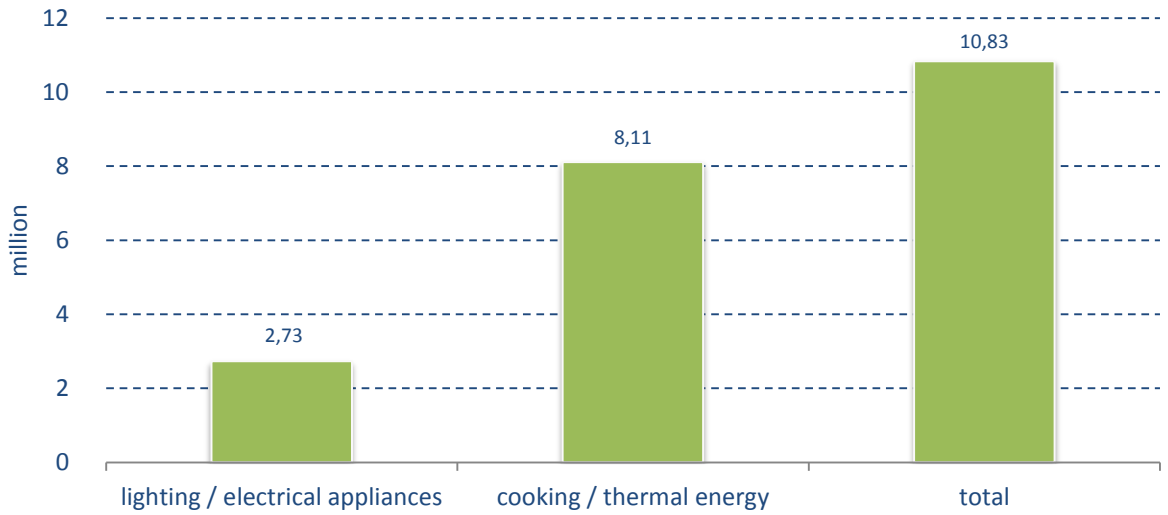
EnDev applies four adjustment factors:

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



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
5	tier 4 services plus use of devices typically requiring a few kilowatt like air conditioners	grid	325.285
4	tier 3 services plus use of devices typically requiring a kilowatt like water heaters, irons	limited grid	241.102
3	tier 2 services plus use of devices typically requiring a few hundred watt like rice cookers, refrigerators	mini-grid	131.838
2	bright light, radio, telephone plus use of devices typically requiring tens of watts like TV, video, fan	solar home system	1.535.476
1	medium bright light and, if possible, limited radio use and telephone charging	picoPV, battery charging station	492.569
		total	2.726.270

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 212,539.

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:

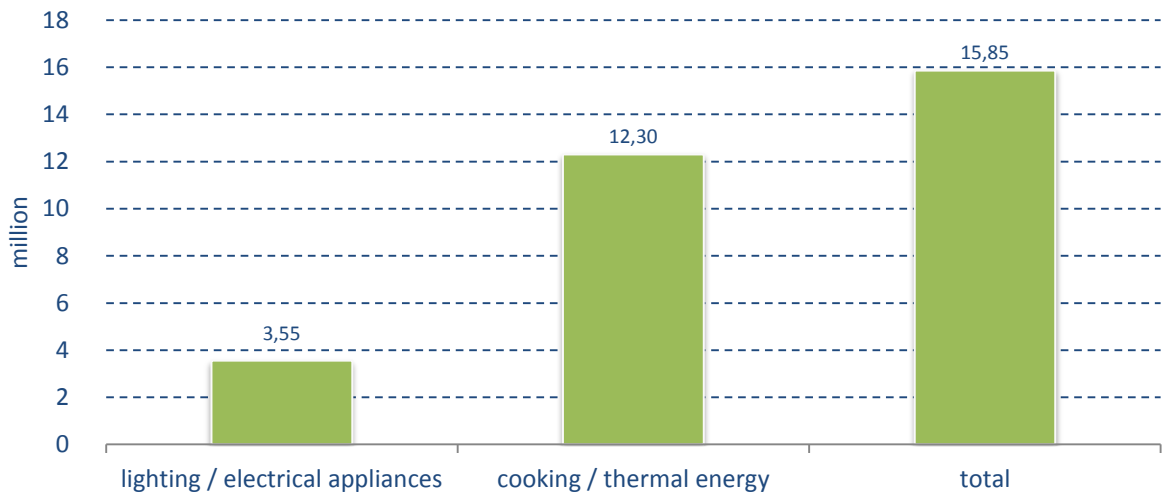
Table B.3: EnDev tier system for improved cookstoves

Tier	Services	Number of people (EnDev methodology)
5	Access to needed quantity of energy source: ≥ very good Health protection: ≥ very high Convenience: ≥ very high	0
4	Access to needed quantity of energy source: ≥ good Health protection: ≥ high Convenience: ≥ high	58,713
3	Access to needed quantity of energy source: ≥ fair Health protection: ≥ fair Convenience: ≥ fair	41,292
2	Access to needed quantity of energy source: ≥ limited Health protection: ≥ sufficient Convenience: ≥ sufficient	3.639.129
1	Access to needed quantity of energy source: ≥ deficient Health protection: ≥ low Convenience: ≥ low	4.355.306
0	Access to needed quantity of energy source: ≥ highly deficient Health protection: ≥ very low Convenience: ≥ very low	14.229
		8,108,669

Overall outcome

Looking at the overall EnDev programme, starting from phase 1 in 2005 up to June 2016 in phase 2, the **total number of people** having gained sustainable access to modern energy services on household level amounts to **15.85 million** (figure B.5). The total number of **social institutions** is more than **23,200**; the total number of **small and medium enterprises** is around **48,500**, respectively.

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



CO_2 savings

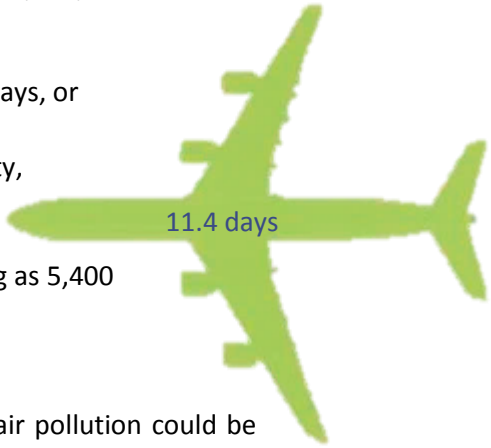
An improved firewood cookstove, which saves 30% of firewood in practice and which is used to prepare 80% of all meals, saves around 0.55 t CO_2 per year (on average, over all EnDev stoves) compared to cooking on open fires. The total savings of all EnDev stoves for one year amount to approximately 1,430,285 t of CO_2. In addition, 214,651 t of CO_2 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 CO_2 per year. A solar lantern replaces approximately one kerosene lamp, saving 0.09 t CO_2 per year.

The total CO_2 saving of 2.8 million stoves and access to solar home systems, mini-grid connections or solar lanterns for 783,433 households supported by EnDev are 1,776,509 t of CO_2.

For comparison: this amount corresponds to

- CO_2 emissions of all intra-European flights during 11.4 days, or
- Norwegian car traffic during 60 days, or
- annual household CO_2 emissions of a medium-sized city, for example, Leverkusen, Portsmouth, Enschede, Trondheim, Ballarat (Queensland) or Bern and Basel r
- planting of more than 4.2 million trees on an area as big as 5,400 football pitches.



Health

As a result of EnDev activities the exposure level of indoor air pollution could be drastically reduced for more than 4.2 [6]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;
- 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 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;

[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.

- **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 840,000 women and 1.7 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 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 2016).

Job creation

Each EnDev project captures information about the time required for production of stove parts as well as for assembly and for installation. Based on the available data and the assumption of 240 working days per year with 8 working hours per day it can be calculated that 2,975 full-time equivalent jobs existed in the process steps of the production, assembly and installation of1,262,481 stoves from Juli 2015 until June 2016.

Most of these work steps are not done by full-time labour. About 2/3 of the EnDev stove projects captured additional data about the number of people working in the production of stoves. These captured values (which include part-time labour) can be compared to the calculated full-time equivalents. The comparison reveals that on average 3.4 persons are involved for each full-time equivalent. Based on this ratio a total of 10,115 people worked in the production and installation of EnDev stoves during the last 12 month.

For calculating the number of jobs created along the distribution chain EnDev applied the methodology published by UNEP[9]. It was calculated that an additional 433 full-time equivalent jobs exist in the distribution chain for stoves. For PicoPV systems, which are mainly produced in China, the number of full-time equivalent jobs along the distribution chain was 419.

Altogether, 3,827 full-time equivalent jobs existed in the supply chain for stoves and picoPV in our partner countries.

The data presented in this chapter are still a preliminary description on the job creation impact of EnDev. EnDev is still working on an elaborate methodology to capture more precisely the job situation along the value chains for energy products and services. In addition, EnDev will analyze the number of jobs that is created as a result of the use of modern energy technologies and services.

Leverage

The total value of all stoves and off-grid systems sold or installed by companies cooperating closely with EnDev was EUR 19.4 million, which is a ratio of 1.32 in relation to the programme expenditures of EUR 14.7 million.

The total amount of investments along the market chain including intermediary products but excluding expenditures for private consumption is about EUR 64.0 million in the current semester alone, representing a ratio of 4.36 in relation to the EnDev programme expenditures.

Peruvian entrepreneurs tap into new opportunities in the energy technology market

Lucerito Julián Castrejón from Soritor in the region of San Martin, Peru, runs her own company selling improved cookstoves and solar lamps. She offers various stove models depending on her customers' needs. EnerSelva, Lucerito's company, sells about fifty stoves per month, earning an average profit of 10,000 Soles (USD 2,940) which she uses mainly for the education of her four children. "I'm proud to say that I've finally formalised my business and can apply for a loan at the bank. I hope my company grows more and more every day," she says contently. This is a big step forward from the humble beginnings: Lucerito started working as cookstove installer. She received training in business skills from EnDev Peru, giving advice on what products to sell, how to finance them and how to promote cookstoves in order to increase her sales. And now she also trains new installers!

Lucerito's case is just one example of the successful market approach of EnDev Peru. Although there are many local subsidies for cookstoves in Peru, customers are willing to pay for good quality, custom-made stoves that are energy efficient and safe. This has created many new jobs in the energy sector, both in rural and urban areas. Moreover, there is progress not just in the cooking sector: solar-powered products like lamps, water heaters and dryers as well as grid connections executed by trained technicians are popular among customers. Technical, social, and ecological benefits have become increasingly important in the decision making process of Peruvians. EnDev-trained entrepreneurs act as knowledge brokers for resource preservation, climate, and energy efficiency. Resourceful vendors have tapped into this opportunity, spreading out in new commercial areas for other modern energy technologies – like Lucerito does by selling solar lamps along with her improved cookstoves.

For more impressions about successful Peruvian energy entrepreneurs watch this video about Lucerito Julián Castrejón promoting improved cookstoves and solar lamps, this one about Diana Paola Vasquez García who owns a solar lamp business, and this video about Gladys Ramos Valdera who builds improved cookstoves that help rural families avoid smoke pollution in their homes. (Spanish with English subtitles)

Installed generation capacity with renewable energies

The total power capacity based on renewable sources installed since the start of EnDev 2 is 36.2 MW. The biggest share amongst the technologies is contributed by mini-grids. Mini-grids contribute 47,8 % to the total result (MHP: 10.5 MW, PV: 6.8 MW). The share of SHS nearly the same with 17.2MW, while picoPV systems up to now have a total installed capacity of 1.6 MW. It is estimated that an additional 15 MW have been installed in the first phase of EnDev resulting in a totally installed capacity of 51.2 MW.

Indirect effects from EnDev interventions

Until now, EnDev's reporting has focussed on the directly attributable results of its interventions. EnDev's effects on the respective markets and sectors are, however, much larger and have an impact on both the numbers of people acquiring access to energy and the transitions in the sector. Although attribution of these results is not as straightforward as with direct outcomes, EnDev's influence in

many cases is clearly visible. Starting this annual planning, EnDev will report on this indirect effects and transitions.

EnDev trains and supports many small entrepreneurs in the sectors, from stove producers (artisanal and semi-industrial), to distributers of pico-PV and stoves, and to developers and operators of micro- and mini-grids. Quality assurance, targeted (start-up) subsidies, business advice supports these entrepreneurs to initiate and further grow their business. In parallel, the demand side is supported with awareness campaigns and an enabling environment is built or strengthened. As business grows, and as the sector/market becomes more attractive, entrepreneurs become less dependent on EnDev support and find customers outside EnDev's monitoring system, or find subsidies and (both soft and commercial) financing from other sources. An extreme example can be found in Bangladesh, where the IDCOL stoves promotion programme makes use of the 3,000 producers and 5,000 sales points for Bondhu Chula stoves that were trained/mobilized by EnDev. Flourishing markets also attract other, non-EnDev supported entrepreneurs providing energy access services to consumers. This may be lower quality "copy-cats" as it can be observed in e.g. Burkina Faso or high quality international operating companies, like Mobisol and M-Kopa attracted by the emerging market for pico-PV in Tanzania's Lake Zone because of EnDev's RBF. In Tanzania and Malawi the RBF approaches led to additional pure commercial sales outside of the RBF context (in Malawi an additional 30% to the RBF results, in Peru sales of SWH suppliers rose by 300% in non-RBF urban areas).

Larger and more professional companies supported by EnDev are groomed for commercial financing and participation in public tendering processes, as is the case in e.g. Tanzania, Benin and Rwanda. By strongly supporting their business approach EnDev also builds a pipeline of professional companies for other and new national and international funds like the upcoming SREP fund in Rwanda, the NAMA and FEI-donor fund in Burkina Faso.

EnDev's strong push for quality products in the markets meets some controversy in discussions about cheap energy access entry solutions for poor households. It, however, leads – in addition to consumer confidence – to important observed results on the sector level. In Indonesia, before the EnDev supported BIRU biogas programme started, the market for domestic biogas digesters was completely destroyed by cheap and low quality equipment. Over the last years BIRU was able to rebuild and grow that market, leaning on very strict quality standards and control mechanisms. As a result, next to a restored customer confidence, which has led to a 35% spin-off market outside the national programme, the government has taken over the BIRU quality standards for its – as a result – considerable allocated budgets for domestic biogas. Also in Indonesia, the strong focus of EnDev on strengthening quality assurance in government processes for sensitization, procurement, installation and monitoring of rural mini-grids has led to increased sustainability of village grid investments in large parts of the sector. In Bangladesh, where Endev introduced together with IFC quality standards for pico solar to the IDCOL programme, it can be observed that also the quality of products outside the IDCOL system increases. EnDev's approach for quality in grid densification/household connections in Peru, leading to a higher percentage of sustainable grid connections, was institutionalized by government and taken over by regional authorities and utilities. The national stove brand in Uganda "good stove – better cooking" provided quality assurance to development partners like USAID, LWF, and CARITAS, to mainstream clean cooking in their portfolio for Uganda.

EnDev also inspires other development partners with its innovative approaches. Especially RBF serves as a model for designing new interventions in the field. Especially World Bank is keen to learn from EnDev's experiences and asks EnDev implementers' support for designs in Guatemala, Mali. In Tanzania RBF inspired the design of a 120 MUSD RBF energy facility at REA, funded by SIDA, DFID, and WB). One could also say that one of the sources of inspiration for DFID's Energy Africa Campaign was the EnDev pico-PV RBF in Tanzania.

EnDev's involvement on sector policy and regulation in Rwanda has, in combination with strengthening of private project developers, led to an app. 20 MW pipeline of (grid-connected) micro-hydropower projects. Unfortunately, this is now stalled because of a necessary renewing of the RE-Fit policy and changing government priorities.

Liberia: The EnDev office has benn crowded ever since the first Solar Cinema film screening took place in February 2016.

Ethiopia: A shop owner sells solar PV systems.

In Liberia, EnDev has supported schools to gain improved lighting through solar lanterns. These pupils can now study at night with lighting bright enough to read.

C. Overview of planned country activities in 2017

The total budget of the second phase is currently EUR 279.5 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 2016 update document). Country activities that are foreseen to be extended without up-scaling are presented in table C.2. Projects that shall be either upscaled or downscaled are presented in table C.3. Table C.4 shows those projects that shall be upscaled or downscaled and extended. Table C.5 presents EnDev sector development activities. The budget of some country projects is subject to availability of sufficient EnDev Global funds. Details are provided in the Annual Planning 2016 update report.

*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
Bangladesh	solar, stoves, solar-RBF	06/09	05/19	25,250	7,050,500
Benin stoves	stoves	10/09	08/18	7,768	1,400,000
Burundi	solar, stoves	09/10	06/18	3,200	130,000
Bolivia	solar, stoves, grid	10/09	08/18	15,000	886,100
Central America	solar, stoves, hydro, grid	09/09	12/18	16,790	451,420
Ethiopia	solar, grid stoves, hydro, stove-RBF	01/10	04/19	29,393	2,119,250
Indonesia	solar, hydro	05/09	07/18	11,960	172,000
Madagascar	stoves	12/12	06/18	800	130,000
Malawi	solar, stoves	12/12	06/17	2,500	725,000
Mozambique	solar, stoves, hydro, grid	10/09	02/18	14,500	549,000
Peru	solar, stoves, grid, SWH, stoves	06/09	06/18	16,920	1,231,500
Uganda	stoves, solar, hydro, grid	04/09	08/18	12,250	707,800
Vietnam	biogas	07/13	06/17	3,740	275,000
RBF Mekong (Cambodia, Laos, Vietnam)	stoves	03/15	02/19	4,096	600,726
RBF Kenya, Tanzania, Uganda	biogas	03/15	02/19	3,870	128,940
RBF Malawi, Mozambique	stoves	03/15	02/19	1,258	640,000
RBF Bangladesh Kenya	off-grid solar	03/15	02/19	4,110	1,111,200
RBF Mozambique, Uganda, Sub-Sahara Africa	grid densification	03/15	02/19	4,421	200,000

*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	in persons
Ghana	solar, stoves, grid	01/10	12/16	06/17	3,150	1,200 (+ 1,180 SMEs)
Tanzania	stoves, solar-RBF	12/12	06/18	10/18	5,660	560,000

Table C.3: Country activities intended to be scaled up or down

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
Rwanda	solar, hydro, biogas	10/09	06/19	15,140	15,440	701,884	825,430

Table C.4: Country activities intended to be scaled up or down and extended

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
Benin r.e.	solar, stoves, grid, picoPV	10/09	06/18	12/18	7,160	8,260	538,689	558,689
Burkina Faso	solar, stoves	09/16	03/17	12/18	6,247	7,597	1,000,000	1,600,000
Cambodia	biogas	12/12	12/16	06/18	2,300	2,550	60,000[7]	34,000
Indonesia	biogas	12/12	12/16	12/18	1,500	2,500	25,000	61,750
Kenya	stoves, picoPV, SHS, mini-grids	04/09	06/18	02/19	19,435	21,435	6,550,000	7,130,000
Liberia	picoPV, SHS, mini-grids, solar dryers and cooking	05/12	05/17	11/18	3,200	4,428	50,500[8]	45,000
Mali	picoPV, SHS, mini-grids, energy kiosks	04/09	12/17	12/18	3,000	4,500	100,000	140,000
Nepal	stoves, hydro, grid	05/09	06/18	12/18	6,965	7,915	399,337	478,500
Senegal	solar, grid, stoves	04/09	03/17	12/18	14,201	16,701	1,065,000	1,765,000[9]

Table C.5: New EnDev sector development activities

Countries	Title	Budget EUR
Bangladesh, Ghana, Kenya, Uganda	Cooking sector support and coordination	2,000,000

[7] The current target proved to be unrealistic as only 26,111 people could be reached by June 2016. Hence, it is more realistic to expect an increase of outcome to 34,000 by June 2018

[8] The old target for stoves proved to be unrealistic. By June 2016 7,500 people got access to improved stoves. It is expected that the number of beneficiaries for cooking can be increased to 10,000.

[9] The current achievement is approximately 55,000 people. A decision on the setting of the final tariffs for off grid electrification is still pending. This decision will influence if EnDev is just focussing on consolidation of the already achieved structures or if further investments into increasing capacities and connections can be justified. In that case the outcome target will be increased to 70,000.

Ethiopia: A woman installing a picoPV solar system.

Ethiopia: The stove manufacturer Genete Taddesse at her production site.

Ethiopia: Solar powered elementary school in Ethiopia.

D. Overview of planned general EnDev activities in 2017

SDG 7 initiatives

SE4All/World Bank-ESMAP energy access programmes/SREP

Most recent data from the International Energy Agency (IEA) and the World Bank demonstrate that despite recent advances in scaling up the deployment of renewables, extending electrification and increasing energy productivity, actions continue to fall significantly short of what is needed to provide affordable, reliable, sustainable and modern energy services for all by 2030. The insufficient progress in creating access to sustainable energy will affect the realization of other SDGs as most SDGs depend on achieving progress on energy (out of 169 SDG targets 125 are linked to energy).

Therefore, SEforAll plans to increase and accelerate its activities for providing energy access and to reduce the climate impact of energy use as described in its recent strategy document[10]. In the period 2016-2021 SEforAll will place special emphasis on empowering leaders of all relevant stakeholder groups and on fostering action-oriented partnerships between key actors. Measuring success by establishing a results framework to track the effectiveness of SEforAll's activities will also play a major role.

EnDev will contribute to SE4All and in general to initiatives and programs targeting SDG7 in several ways:

a. It will be in regular contact with the global team of SEforAll, as well as with international partners such as the World Bank and regional and national partners to support the implementation of national strategies and projects for achieving universal access.

b. EnDev will contribute to elaborations and updates of rapid assessment and gap analysis (RAGA), Action Agendas, and Investment Prospectuses that identify programs and projects for investments and funding. Special attention will be laid on harmonizing energy strategies with the NDCs.

c. EnDev will continue to provide capacity building of partners to articulate coherent strategies that integrate centralized and de-centralized access modes, improve planning and coordination of grid and off-grid development and to strengthen implementation capacities at the national level especially for rural markets.

d. EnDev will bring in its experiences with social institutions like health centres and schools and to reach poor households in remote areas who are generally not benefitting from business-as-usual approaches.

e. EnDev's will also strengthen the gender dimension of SE4All as women benefit more than men from EnDev activities to promote clean cooking technologies, from light for education, reliable energy services at birthing clinics and other health facilities, and from jobs created in the energy supply chain including as small-scale entrepreneurs, especially in the clean energy businesses. EnDev will communicate these results to the SE4All gender working group.

f. EnDev supports local governments, civil society, and private sector partners to support the design, piloting and replication of innovative access strategies, especially in off-grid or hard-to reach areas. This will help ensure that the poorest households are enabled to access a minimum threshold of energy consumption without assuming unmanageable financial risk.

g. EnDev will initiate impactful Public Private Partnerships mobilising private investments in the off-grid energy sector.

[10] GOING FURTHER, FASTER - TOGETHER: A STRATEGIC FRAMEWORK FOR RESULTS | 2016-21.

h. EnDev shares its lessons learnt with other actors at national and international level on market development for last-mile energy access. A dynamic market development in rural areas offers opportunities for new jobs and economic development.

i. EnDev will contribute to track progress in delivering energy access and achieving SDG7 on international and national level. EnDev will continue its discussion with World Bank/ESMAP and WHO to refine the Global Tracking Framework and its Multi-Tier Framework especially regarding the indicators (service attributes) for off-grid electrification and modern cooking systems. It will also support local statistical and census offices in cooperation with others to establish reliable tracking systems on national level. Data from EnDev shall help to improve analysis of the energy situations and interventions along the energy market chain.

AREI

Set against the background that in 2013, only 290 million of 915 million people in Africa had access to electricity and 80% of Africans rely on firewood for cooking, African governments launched the Africa Renewable Energy Initiative (AREI) at CoP21 in Paris. The initiative aims to increase Africa's installed renewable energy capacity by 10 GW by 2020 and by 300 GW by 2030. The initiative is not restricted to the installation of new capacity. It targets the overall acceleration of access to energy for all and the deployment of renewable energy on the continent. In its guiding principles it is stated that AREI can promote the full range of renewable electricity applications, from grid-connected to mini-grids to small stand-alone systems, as well as other forms of energy, with particular consideration being paid to applications that meet the needs of poor people.

Looking at the current pipeline of projects the pro-poor energy access agenda, however, is not very well developed, in particular when it comes to cooking, but also in the electrification of rural households, clinics, schools and SMEs.

EnDev's work in Africa fits well with AREI and has the potential to provide a meaningful contribution to the AREI ambitions. EnDev can be part of projects attributed under the Africa Renewable Energy Initiative (AREI), can prepare the ground for high impact (upscaling) investments from other public and private sources, as well as be a program receiving funding through AREI funds:

- If EnDev becomes part of AREI it could minimum report its results to AREI. It would require acceptance of the EnDev donors as well as AREI.
- If EnDev acts as pipeline developer for national or international investments, or when it applies for AREI funding it could develop the basic c.q. proposals
  a. for policy support activities such as developing policy measures and building capacity in governments to scale up successful market models to nationwide policy approaches or
  b. for renewable energy installations and/or markets, in the form of energy access oriented projects and programs. Taking the lessons from successful market models, EnDev could develop a pipeline of investment projects that allow scaling of EnDev interventions with AREI funds. These projects would become EnDev spin-off projects or EnDev/AREI joint-venture projects.

EnDev will explore with the AREI Independent Delivery Unit how EnDev can further contribute to AREI's pipeline in terms of policy support projects and investment projects that would scale up successful EnDev approaches in Africa.

Energy Africa

On 22 October 2015 DFID launched the Energy Africa Access campaign with the aim to significantly upscale off-grid renewable energy solutions, in order to provide several million households with modern energy access in sub-Saharan Africa. The initiative is based on the fact that most of the 600 million people in sub-Saharan Africa lacking access to electricity will not be reached by the grid for many years, if ever, creating the need for new technologies and business models to enable off-grid

electricity access. The initiative seeks to come to political agreements with partner countries through compacts with concrete commitments on investment and policy reforms, technical assistance and financing necessary to move off-grid solar in Africa from a nascent market to a highly dynamic market contributing towards universal electricity access.

Within the frame of the initiative DFID put two components out to tender: the Africa Clean Energy Business (ACE) component targeted to catalyse African private sector innovation and investment and the Transforming Energy Access Research (TEA) component to support applied research and innovations.

EnDev was invited to participate in both calls for tenders but due to the internal rules of GIZ and RVO the managing organizations of EnDev are not able to bid alone or as part of a consortium.

Despite this ENDEV will keep track of the procurement processes for ACE and TEA attempt to engage with and make proposals to the winning consortium contracts to align activities in the field. EnDev will specifically contribute to Energy Africa and its components in the following way:

a. Provide technical advice before and after signature of compacts on how to design and implement policy reforms such as removing fiscal and import barriers
b. Provide market information and data for investors and firms supported by ACE and TEA
c. Support the definition and enforcement of national and international quality standards in coordination with the compact
d. Support networking between national and international firms and investors
e. Provide capacity building to selected firms and partner organisations
f. Provide Result Based Financing and incentives to overcome start-up cost in difficult market segments, for reaching the poorest consumer groups.
g. Promote consumer awareness about off-grid technologies and strengthen consumer rights and protection

Power Africa

The Power Africa initiative was launched by President Barack Obama in 2013. The initiative aims at adding more than 30,000 megawatts (MW) of clean, more efficient electricity generation capacity as well as increase electricity access by adding 60 million new home and business connections throughout all of sub-Saharan Africa. The initiative is supported by SIDA, the World Bank, and OPIC and is managed by USAID and AfDB. Focus countries of the Power Africa are: Tanzania, Kenya, Ethiopia, Ghana, Nigeria and Liberia. The initiative comprises several funds which shall raise several billion USD in renewable energy investments as well as grants and guarantees.

EnDev has only recently come into contact with Power Africa and will provide its monitoring experiences to the monitoring unit of the initiative.

Lighting global/World Bank-IFC-ESMAP/GOGLA

Lighting Global is a program to supporting sustainable growth of the international off-grid lighting market as a means of increasing energy access to people not connected to grid electricity. Since several years EnDev is cooperating with the Lighting Africa/Lighting Global initiative. EnDev is currently coordinating several country projects such as Bangladesh, Ethiopia, Kenya, and Tanzania with Lighting Global. In Kenya this is formalized in a MoU. 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 represented by GIZ in the advisory board of GOGLA.

RECP/AEEP/EUEI-PDF

The Africa-EU Renewable Energy Cooperation Program (RECP) is an African-European platform for promoting renewable energy market development and investment in Africa as part of the Africa-EU Energy Partnership (AEEP).

The RECP is currently funded by Austria, Finland, the European Commission, Germany and the Netherlands. The program is being implemented in a mix of in-country as well as global activities that are structured into four interlinked sub-components: a) supporting policy advisory; b) private sector cooperation; c) access to finance; as well as d) innovation and skills development.

EnDev is discussing with RECP possibilities to coordinate activities of both programs specifically regarding creating favorable frame conditions for investments, market studies and training of entrepreneurs. In addition, EnDev is planning with EUEI-PDF a joint publication on guidelines for national electrification policies that shall give an overview about policy instruments to promote access to electricity.

Energising education: the case of EnDev Liberia

How energy access can be used for education is shown by EnDev Liberia. The country project implements solar systems in rural areas, mainly in schools and health centres. For instance, EnDev installed solar lights in 18 public and private schools in Nimba (both Bu-Yao and Kparblee Administrative District near the border to Ivory Coast). There, the Buutuo Christian Union School uses the lighting for its adult literacy programmes that are carried out in the evenings. EnDev also trained the users in the operation of the solar panels to increase the ownership for and sustainability of the technology.

Another approach is done directly at the EnDev office: it educates the young generation on renewable energy. The Monrovia office, which runs solely on solar power, started to show films for children from the neighbourhood in the evening. The first screening in February 2016 was well received – the office was crowded. The children could enjoy the film without any noise of a diesel generator, the electricity was provided by powerful batteries charged during the day. What began earlier this year is now known as 'Solar Cinema'. For EnDev it means educating children about the influence of renewable energy on their lives, creating awareness for the importance of modern energy.

Climate initiatives

NDC partnership

In the Paris climate negotiations 195 nations agreed to limit global warming to less than two degree Celsius compared to pre-industrial levels and to pursue efforts to limit temperature increase to 1.5 °C above pre-industrial levels. Furthermore 146 countries pledged draft national climate contributions (NDCs) as the targets of their individual countries that will become targets under UNFCCC as soon as a country has ratified the Paris agreement. More than ninety percent of the Intended Nationally

Determined Contributions (INDCs) submitted as of April 2016 outline national efforts to address emissions in the energy sector, the most cited action area. In parallel all 195 countries acknowledged in the Paris agreement "the need to promote universal access to sustainable energy, in particular in Africa, through the enhanced deployment of renewable energy."

Hence, most developing countries will strive for a double goal: provide access to modern energy and reduce/avoid greenhouse gas emission. The EnDev partnership is following the same path seeing the importance of the development and climate change nexus. For EnDev the promotion of sustainable access to modern energy services in developing countries is a means to inclusive social, economic and low carbon development. EnDev is already promoting the development of markets for energy technologies in LDCs that are climate-smart and environmentally friendly and thus contribute to a climate resilient development. EnDev has been registered in the "NDC funds and initiatives navigator" portal showing programs that support the implementation of NDCs. EnDev will further explore modalities of cooperation with the NDC partnership.

In 2017, EnDev is particularly planning the following specific activities to support the implementation of the NDCs.

a. EnDev will analyse the role and priority placed by countries on energy access and on sustainable energy in their NDC and contribute to a harmonization of national energy plans and NDC.
b. EnDev will participate in energy sector and climate dialogues in the different countries and support actions to deliver SDG 7 and the Paris Agreement at the same time.
c. EnDev will refine and use its monitoring and evaluation system to capture climate effects and to direct activities targeting to contribute to the Paris Agreement.

Green Climate Fund

EnDev and the World Bank (ESMAP) have worked out the concept for a joint multi-country proposal for a comprehensive clean cooking sector development for the **Green Climate Fund** (GCF). The program targets a gradual transformational change from the current traditional cooking practices (open fire or traditional biomass stoves) to ever cleaner, safer and more efficient cooking practices. The objective is to accompany the nascent clean cooking sector through the most risky years of early market development - up to the point where the private sector is able to drive the markets on its own. This transformation approach builds on the experience of 10 years of the EnDev partnership developing the capacity of rural markets for biomass based cooking solutions in over 20 countries, innovative approaches developed by the WBG in Asia, Africa and Latin America in the past 10 years and the market transformation experience of the WBG with the Lighting Africa program (which used a similar paradigm shift to scale up global off-grid lighting markets). Furthermore, through the participation of the GACC, global advocacy will inform the transformation processes in the target countries (and vice versa).

The program will have five components that will be adapted to individual country contexts.

Component 1 – Strengthened enabling environment and consumer awareness. This component will help countries to streamline the institutional and policy frameworks, improve sector coordination and develop roadmaps for achieving universal access. In addition, it will assist countries to develop quality assurance frameworks, including capacities for cookstove/fuel testing, certification and labelling.

Component 2 – Strengthened private sector capacity and sustainable supply chains. The component will provide targeted (financial and technical assistance) resources to help companies to overcome key bottlenecks for increasing production or distribution of cookstoves, including provision of working capital to increase stocks, support development of supply chains, support development of recruitment and retention strategies for female and male employees, support research and development and improvement of stove quality and performance to comply with required standards.

Component 3 – Results-based incentives for the private sector. Results based finance shall drive private sector interest in the sector and promote in particular environmentally sound, health-protecting, socially impactful stoves, which face more adoption barriers due to their higher price.

Component 4 – Acceleration of innovations that will drive transformation of stove and fuel markets. Transformation of the sector will require innovation and advances in all aspects of the sector including technology, financing, supply chain, enabling environment, inclusive distribution chains, awareness and behavior change. The component will support innovative ideas that have a potential to become "game changers" in the scale-up efforts and/or fill in the existing gaps, using different instruments, at national and international level, including competitions and prizes.

Component 5 - Monitoring of program activities and result, building evidence on health, environmental and gender impacts. At the country level, the program will support emission testing of the stove/fuel performance – both in the lab and in the field, as well as the overall monitoring of results and documentation of key lessons.

The Program's direct result will be 7.4 million cleaner and/or more efficient cookstoves adopted by households over the four years of the Project implementation. The estimated overall GHG emission reduction from the program will be about 13 $MtCO_2eq$. In addition, the program will produce significant health, gender and economic co-benefits.

It is planned to submit a full proposal as soon as GIZ is accredited. Meanwhile a draft proposal will be put forward to the GCF secretariat.

1 Gigaton Coalition

The 1 Gigaton Coalition was initiated in 2014 with the aim to increase efforts to measure and report reductions of greenhouse gas emissions in developing countries. Renewable energy and energy efficiency programmes in developing countries are making great strides towards reducing GHG emissions. However, most of these efforts have neither been measured nor reported. Therefore, the 1 Gigaton Coalition contributes to:

i. Standardising and harmonising methods for measuring and reporting of GHG emissions from the energy sector to be aligned with IPCC guidelines by 2020;

ii. Expanding the measurement and reporting of GHG emission reductions to include most of the initiatives promoting renewable energy and energy efficiency in developing countries; and

iii. Encouraging the scaling-up of efforts to promote renewable energy and energy efficiency in order to reduce GHG emissions even further.

EnDev is part of the **1 GigaTon Coalition** and provides regularly its results on the reduction of greenhouse gas emission and on the used methodology. Information on EnDev is found in the reports of the coalition. EnDev will continue to participate in discussion and dialogues on how to reduce information gaps on emission and appropriate calculation methods.

Challenges

EnDev's responsiveness to the developments and trends elaborated in chapter A as well as its increasing engagement with global initiatives, as described above, will present some challenges for EnDev's operation and reporting.

First of all, its operations diversify further from strict outcome orientation (in terms of people connected) to include sector policy advice, exchange more intensely with international initiatives and actors without a direct attributable result to EnDev's core outcomes. Second, moving into refugee and IDP settings means circumstances for sustainable energy accesses are much less favourable than in average EnDev projects, and costs of interventions are considerably higher. Third, attribution to EnDev's interventions will become increasingly difficult with a growing number of cooperating

partners, especially with large investments (concessional and/or commercial loans, climate financed grants, etc.) on the sector level.

As long as the changes to EnDev's operation are modest, there will be no impact for EnDev's cost efficiency benchmark. When the situation occurs that the new developments take off in such a way that cost benchmarks cannot be maintained at the current level, EnDev will seek further guidance from the governing board. At this point it is also hard to predict where a revised benchmark could be expected.

In addition to its current reporting on direct outcomes, EnDev will report more on co-benefits and indirect outcomes and impacts (for which attribution however will be less clear and has to be made plausible case by case). To date, EnDev has not or only very conservatively reported on these, as can be seen from chapter B. Nevertheless, it will be relevant to demonstrate that the impact of EnDev's work reaches far beyond its direct outcomes. Discussions on measuring outcomes (multi-tier framework) and attribution are also on-going in the framework of SEforAll and SDG7. EnDev's communication activities and strategy will be adapted, too.

Malawi: Firing stoves in a kiln in Nkhotakota near by the lake Malawi.

Ethiopia: A solar PV system retailer in his shop.

Rwanda: Old and new. Many customers of Off-Grid Electric SHS had some sort of access to electricity before: either solar lamps or solar home systems (mostly of inferior quality).

Kenya: Survey with a mobile application allows collecting data faster and more easily.

Malawi: EnDev staff testing the EnDev Survey Application in the field.

Ethiopia: a Mirt stove with chimney.

Madagascar: With the support of a hydraulic press the clay is formed under high pressure into a burning chamber. This process is faster and more exact than manufacturing by hand.

Benin: Participants of a stove production training.

Abbreviations

ABC	advanced biomass cookstoves
ABERME	Agence Béninoise d'Electrification Rurale et de Maîtrise d'Énergie / Agency for rural electrification and energy Control, Benin
ACCS	Advanced Clean Cooking Solutions
ACE	Africa Clean Energy Business
ADEL	Agenda de Desenvolvimento Econômico Local
ADES	Association pour le Développement de l'Energie Solaire, Switzerland
ADES	Association pour le Développement de l'Energie Solaire, Madagascar
AEEP	Second High Level Meeting of the Africa-EU Energy Partnership
AEME	Agence pour l'Economie et la Maîtrise de l'Energie, Senegal
AEPC	Alternative Energy Promotion Centre, Nepal
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 Developpement de l'Energie Domestique et de l´Electrification Rurale, Malian Agency for Household Energy and Rural Electrification, Mali
ANADER	Agence Nationale de Développement des Energies Renouvelables et de l'Efficacité Energétique, Benin
ANER	Agence Nationale des Energies Renouvelables, National Agency for Promotion of Renewable Energy, Senegal
AREI	Africa Renewable Energy Initiative
ASDDG	Action Sud Développement Durable Genève, Madagascar
ASER	Direction de l'Energie, Agence Sénégalaise de l'Electrification Rurale, Senegalese Rural Electrification Agency
AVSI	Associazione Volontari per il Servizio Internazionale, NGO
BCCs	biogas construction companies
BCEs	Biogas Construction Enterprises
BCSs	battery charging stations
BECT	Biomass and Energy Certification and Test Center, Mozambique
BMZ	the German Federal Ministry for Economic Cooperation and Development
BSREA	Bangladesh Solar & Renewable Energy Association
BTC	Belgian Technical Cooperation
CB	Chitetezo Mbaula, Malawi
CCAK	Clean Cookstoves Association of Kenya
CCC	Malawi's annual Cleaner Cooking Camp
CCCSP	Cambodia Climate Change Strategic Plan
CDM	Clean Development Mechanism
CES	Cooking Energy System approach

CO_2e	CO_2 equivalent
COOPI	Cooperazione Internazionale, Italy
CPO	Construction Partner Organization
CREE	Community Rural Electrification Entities, Nepal
CREF	Central Renewable Energy Fund
CREP	Community Rural Electrification Programme, Nepal
CSC	Customer Service Centre
CSI	Credit Sanctioning Incentive
C-SIREA	Capacity for a Successful Implementation of the Renewable Energy Act, Ghana
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
DGER	General Directorate of Rural Electrification, Peru
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
EARP	Energy Access Roll out Plan, Rwanda
EAT	energy access technologies
ECG	Electricity Company of Ghana
EdM	Electricidade de Moçambique/ Energy Public Utility, Mozambique
ELCOM	ELectrification COMmunale, Mali
EnDev	Energising Development programme
ENEE	Empresa Nacional de Energía Eléctrica/ National Electric Energy Company, Honduras
EOIs	expressions of interest
EPP	Emergency Power Programme, USAID, Liberia
ERSEN	The Rural Electrification Senegal Programme
ESMAP	Energy Sector Management Assistance Program
ESME	Energy SME programme, WB, Rwanda
FABEN	Foyers Améliorés au Benin/ Improved cookstoves in Benin
FAFASO	Foyers Améliorés au Burkina Faso/ Improved cookstoves in Burkina Faso
FASEN	Foyers Améliorés au Sénégal/ Improved cookstoves in Senegal
FHIA	Honduran Foundation for Agricultural Research
FIE	Fonds d'Intervention de l'Environnement
FIs	finance institutions
FOCAEP	Central American Fund for Access to Sustainable Energy and Poverty Reduction

FODIEN	Electricity Industry Development Fund, Nicaragua
FONERWA	Rwandan Climate Fund
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
GCF	Green Climate Fund
GEDAP	Ghana Energy Development and Access Project
GEF	Global Environment Facility
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
GOGLA	Global Off-Grid Lighting Association
GTF	Global Tracking Framework
HH	households
HIVOS	Humanistisch Instituut voor Ontwikkelingssamenwerking
HPNET	Hydro Empowerment Network
IAQG	Indoor Air Quality Guidelines
ICF	Conservación y Desarrollo Forestal, Honduras
ICS	improved cookstove
IDBP	Indonesia Domestic Biogas Programme
IDCOL	Infrastructure Development Company Limited
IEA	International Energy Agency
IFC-LG	International Finance Corporation - Lighting Global
INDC	Intended Nationally Determined Contribution
IRSAT	Institut de Recherche en Sciences Appliquées et de Technologie, Burkina Faso
ISAK	the Improved Stoves Association of Kenya
IVA	independent verification agent
IVA	independent verification agent
IWM	improved water mills
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
LESEP	Liberia Electricity Enhancement Project, World Bank, Libria
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
LPG	Liquefied Petroleum Gas

MAFF	Ministry of Agriculture, Forestry and Fisheries, Cambodia
MARD	Ministry of the Agriculture and Rural Development, Vietnam
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
MEP	Ministry of Energy and Petroleum, Kenya
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
MFA / DGIS	Netherlands Ministry of Foreign Affairs Directorate-General for International Cooperation
MFA-NOR	the Norwegian Ministry of Foreign Affairs
MFI	micro finance institution
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
MINEDU	Ministry of Education, Peru
MINEM	Ministry of Energy and Mines, Peru
MININFRA	Ministry of Infrastructure, Rwanda
MME	Ministry of Mines and Energy, Cambodia
MOAP	Market-Oriented Agriculture Programme, Ghana
MoEF	Ministry of Environment and Forests, Bangladesh
MoEP	Ministry of Energy and Petroleum, Kenya
MoFA	Ministry of Food and Agriculture, Ghana
MoHA	Ministry of Home Affairs, Indonesia
MoP	Ministry of Power, Ghana
MoPE	Ministry of Population and Environment, Nepal
MoST	Ministry of Science and Technology, Laos
MoU	Memorandum of Understanding
MoWIE	Ministry of Water, Irrigation and Energy, Ethiopia
MVCS	Ministry of Housing, Construction and Sanitation
MW	megawatts
NACEUN	National Association of Community Electricity Users Nepal
NAMA	Nationally Appropriate Mitigation Actions
NBP	National Biodigester Programme, Cambodia
NBPSO	National Biogas Programme Support Office

NBSSI	National Board for Small Scale Industries, Ghana
NCSC	National Cookstoves Steering Committee, Malawi
NDBP	National Domestic Biogas Programme, Rwanda
NDC	national climate contributions
NEA	Nepal Electricity Authority
NEDCo	Northern Electricity Distribution Company, Ghana
NEEP	Nepal Energy Efficiency Programme
NRREP	National Rural and Renewable Energy Programme, Nepal
OES	social electrification office
OSINERGMIN	The Energy and Mining Investment Supervisory Body, Peru
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
PBPOs	Provincial Biogas Programme Offices
PDP	Project Development Programme, BMWi/GIZ, Mozambique
PERACOD	Promotion of Renewable Energies, Rural Electrification and Sustainable Supply of Household fuels, Senegal
PFPER	Partenariat pour la Formation Professionnelle Energie Renouvelable" au Bénin
picoPV	pico photo voltaic
PMU	Biogas Project Management Unit, Vietnam
PNESER	Programa Nacional de Electrificación Sostenible y Energías Renovables, Nicaragua
PO	partner organisations
PPP	public private partnership
PREEEP	Promotion of Renewable Energy and Energy Efficiency Programme
ProEcon	Economic Development Programme, GIZ/BMZ, Mozambique
ProEducaçao	Education Programme, Mozambique
PSED	BMZ Programme for Sustainable Economic Development, Ghana
PU	productive use of energy
QPI	Quality Plant Incentive
QSEAP	Quality and Safety Enhancement of Agricultural Products and Biogas Development Project, Asian Development Bank
RAGA	rapid assessment and gap analysis
RBF	results-based finance
REA	Rural Electrification Agency
RECP	Africa-EU Renewable Energy Cooperation Programme
REG	Rwanda Energy Group
REP	Rural Enterprise Programme, Ghana
RERL	Renewable Energy for Rural Livelihood, UNEP and WB, Nepal

RES	Rural Electrification Strategy
RREA	Rural Renewable Energy Agency, Liberia
RVO	Rijksdienst voor Ondernemend Nederland
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
SGF	Small Grants Programme of the Global Environment Facility
SHS	solar home system
SI	social institutions
SLM	Sustainable Land Management Programme, Ethiopia
SME	small and medium enterprise
SMSS	solar multi service stations
SNV	Stichting Nederlandse Vrijwilligers / Netherlands Development Organisation
SREDA	Sustainable and Renewable Energy Development Authority
SREP	Scaling Up Renewable Energy Programme
SSHS	small solar home systems
STEP	Sustainable Training and Education Programme, Ethiopia
SWH	solar water heaters
TAREA	Tanzania Renewable Energy Association
TEA	Transforming Energy Access Reearch
TIB	Tanzania Investment Bank
TICS	Tanzania Improved Cook Stove programme
UEM	Eduardo Mondlane University, Mozambique
UNEP	United Nations Development Programme
UNI	National University of Engineering, Peru
UOB	Urwego Opportunity Bank
UW	Distribution network "Umuco W'izuba" (engl. Sunbeam), Burundi
VMEEA	Vice Ministry for Electricity and Renewable Energy, Bolivia
VWU	Vietnamese Women's Union
WBG/WB	World Bank Group
WOCAN	Accelerating Investments in Women through Certification
YRE	Yayasan Rumah Energi, biogas association in Indonesia

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