# Progress Report 2013

on

## Energising Development – Phase 2

Partnership between

**The Netherlands Ministry of Foreign Affairs**

**The Norwegian Ministry of Foreign Affairs**

**The Australian Department of Foreign Affairs and Trade**

**The UK Department for International Development**

**The Swiss Agency for Development and Cooperation and**

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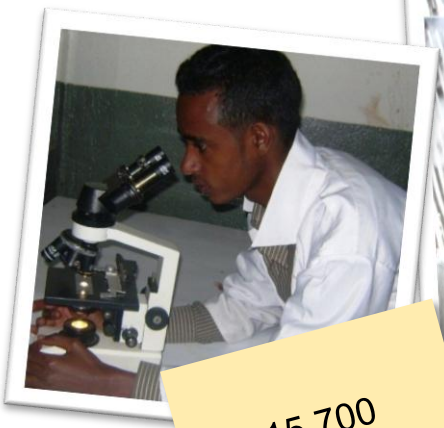
## Key achievements

2.46 million

household members with electricity

28,300

small and medium enterprises with a modern form of energy



15,700

social institutions with a modern form of energy

9.90 million

household members with improved cookstoves

More than

32,000

technicians, stove producers, sales men etc. trained

1.19 million t of $CO_2$

saved per year

# A. Executive summary

In 2013, the EnDev Partnership comprised 26 projects in 24 different countries. The focus of the programme is on Least Developed Countries (LDCs) and specifically on Africa. 64% of EnDev 2 funds are allocated to activities in LDCs and 57% to African countries.

By December 2013, EnDev 2 had facilitated sustainable[1] access to modern energy services[2] to 7.24 million people. Households were connected to the national grid or isolated grids, or use electricity through photovoltaic systems. Others benefited from improved and cleaner cooking technologies, such as improved firewood and charcoal stoves or biogas plants (Table 1).

| lighting / electrical appliances | cooking / thermal energy | household total |
|---|---|---|
| 1.63 | 5.71 | 7.24 |

**Table 1: Adjusted number of people with access to modern energy (EnDev 2; in million)**

In addition, more than 8,200 schools, health stations and community centres got access to improved cooking energy or electricity, or other modern energy carriers. Further, 16,400 small and medium enterprises gained access to modern forms of energy for productive use.

These figures take into account:

- a “sustainability adjustment factor” (SAF), which takes into consideration that the access to modern energy technologies is not sustainable in all cases;
- a “windfall gain factor” (WGF), considering that some households would have gained access to modern energy services anyway even without EnDev support; and
- a “double energy factor” (DEF), which accounts for households and social infrastructure institutions which already have access to modern energy services in the same category (modern cooking energy technologies or electricity).

**adjusted number of people = number of monitored beneficiaries - (SAF, WGF, DEF)**

When reporting a combined access figure for electricity and cooking, we also take into account a fourth adjustment factor:

- a “double EnDev factor”, which ensures that households benefitting from both modern cooking energy and electricity through the EnDev programme are only counted once in the total figure.

Based on this conservative counting system, the EnDev programme (phase 1 and 2) has so far facilitated sustainable access to modern energy service on household level to

## 12.26 million people.

Access to modern energy is considered critical to sustainable development, to poverty reduction and to improving living conditions in developing countries. Thus, access to affordable and sustainable energy services contributes towards achieving the Millennium Development Goals (MDGs). Furthermore, EnDev contributes to the goals of the Sustainable Energy for All (SE4All) initiative.

EnDev continuously analyses the impacts of its country activities to verify the assumptions regarding the relation of energy access and sustainable development. In addition, the

[1] Sustainable access here refers to long-lasting access.

[2] The term modern energy service refers to electricity as well as to natural gas, LPG, and biogas as cooking fuels and to advanced cookstoves for solid fuels that have higher combustion efficiency (at least 40% in comparison to traditionally used stoves).

sustainability of the EnDev results and impacts are regularly investigated. Since 2009, EnDev has carried out almost 100 baseline, impact and sustainability studies. Results of the studies until 2012 were presented in previous reports. The present report adds to these key findings of studies finished in 2013.

Financially, EnDev developed as scheduled. The expenditures for EnDev 2 activities in 2013 reached a new peak of EUR 31.6 million.

# B. Introduction – Energising Development Partnership – Phase 2

## B.1 Overall Objective of the Energising Development Programme

The Energising Development (EnDev) programme is a coordinated and harmonized effort of several donors to improve energy access on global scale as main target. The donor partnership consisted in 2013 of:

- the Netherlands Ministry of Foreign Affairs Directorate-General for International Cooperation (MFA / DGIS),
- the German Federal Ministry for Economic Cooperation and Development (BMZ),
- the Norwegian Ministry of Foreign Affairs (MFA-NOR),
- the Australian Department of Foreign Affairs and Trade (DFAT),
- the UK Department for International Development (DFID) and
- the Swiss Agency for Development and Cooperation (DEZA / SDC).

Within the current budget, EnDev aims to achieve sustainable access to energy for minimum 15 million people worldwide by 2018 (5 million in the first phase: 2005-2009, another 10 million in the second phase: 2010-2018).

The outcomes are considered a measurable and significant contribution to the achievement of the MDGs, as energy is a key requirement to reduce poverty and to improve the standard of living, and an input for economic activities and growth. Consequently, the success of the programme does not only depend on the number of people reached but also on the impact of the modern energy service provided on income, health, education and well-being.

## B.2 Relevance of EnDev for International Energy Initiatives and Partnership with other Organisations and Programmes

In late 2012, the United Nations General Assembly declared the decade 2014- 2024 as the "Decade of Sustainable Energy for All", highlighting the importance of access to modern energy services for sustainable development. The resolution calls upon member states, governments, as well as relevant international and regional organizations and other relevant stakeholders, to increase efforts to improve access to reliable, affordable, economically viable, socially acceptable and environmentally sound energy services and resources.

The declaration of the Decade reflects the growing international interest in renewable energy and energy access which was already visible in 2012 in the "International Year of Sustainable Energy for All" and which cumulated in the SE4ALL initiative launched by the Secretary-General. Meanwhile, many partner countries have developed action and master plans to improve energy access and several donors, NGOs and companies made commitments as part of the initiative.

EnDev contributes towards the goals of SE4ALL. The EnDev programme has been a pioneer of the energy access agenda since the programme start in 2005. EnDev also understands itself as a complementing partner of other initiatives such as:

The **Energy+** initiative, launched in 2011 with the objective to combine universal access to sustainable energy and the reduction of greenhouse gas emissions in developing countries by scaling up access to renewable energy sources and increasing energy efficiency. Eleven developing countries (Kenya, Bhutan, Liberia, Ethiopia, Maldives, Senegal, Morocco, Tanzania, Nepal, Mali, Grenada and Mozambique) are partners of Energy+. In five of them, activities have started to pilot the Energy+ approach: Nepal, Bhutan, Ethiopia, Kenya and Liberia. EnDev overlaps with four of these countries (except Bhutan).

The **Scaling-up Renewable Energy Programme (SREP),** which is part of the Strategic Climate Fund (SCP) within the framework of the Climate Investment Funds (CIF). The

programme aims at demonstrating the economic, social, and environmental viability of low carbon development by financing technologies such as solar, wind, bio-energy, geothermal, and small hydro technologies. SREP pilot projects, relevant for EnDev country activities are: Ethiopia, Kenya, Liberia, Mali, Tanzania, Honduras and Nepal.

The **Africa-EU Energy Partnership (AEEP),** launched in 2010 with the commitment to bring access to modern and sustainable energy services to at least an additional 100 million Africans by 2020, is focussing on sustainable models: to provide energy for basic services (health, education, water, communication); to power productive activities; and to provide safe and sustainable energy services to households. AEEP promotes strategic dialogue between Africa and the EU aimed at sharing knowledge, setting political priorities and developing joint programmes on key energy issues.

The **Africa-EU Renewable Energy Cooperation Programme (RECP),** which supports a) the improvement of regulatory frameworks and the strengthening of institutions through policy advisory services, b) private sector networking and business meetings, c) bringing projects to bankability by providing technical assistance with financing, and d) knowledge exchange through workshops and training programmes.

The **EU Africa-Caribbean-Pacific Energy facility (EU-ACP EF)** and the **EU-Africa Infrastructure Trust Fund (ITF)** are further elements supporting the commitment of the **European Commission** to provide access to sustainable energy services to 500 million people by 2030. EnDev receives co-financing from the EU-ACP EF for individual country measures.

The **ECOWAS Renewable Energy Programme (EREP),** which is supported by the Africa-EU Renewable Energy Cooperation Programme (RECP), is designed to facilitate the standardisation of renewable energy technologies; to promote a regional market for investment; and complements existing and planned national policies. Among others, EREP aims to provide energy to 22% of rural populations by 2020, and to 25% by 2030 with off-grid solutions.

EnDev is closely cooperating with several organizations on international level to coordinate and synergise the work as much as possible. In 2013, most relevant cooperation partners for EnDev on global level have been:

- The **World Bank**, especially the Sustainable Energy Department, ESMAP and the Lighting Africa team: EnDev played a major role in the definition of access and the different tier levels for the SE4ALL Global Tracking Framework, which was coordinated by the Sustainable Energy Department. EnDev sent extensive comments to improve the different draft versions that had been prepared for the framework. The access indicators for electricity in the last version of the tracking document, which was published during the Vienna conference, are consistent to a large extent with the EnDev indicators. However, some details are still under discussion. The indicator for access to modern cooking needs a more fundamental review. The cooperation with **Lighting Africa** focused on supporting market research, networking between international and local entrepreneurs, financing facilitation, developing standards, certification and labelling, aggregating market demand, knowledge sharing and capacity building on international and on country level. EnDev also supported the **Global Off-Grid Lighting Association (GOGLA)** to take over certain tasks in developing further the certification system for solar lanterns and the labelling of products.
- The **Global Alliance for Clean Cookstoves (GACC):** EnDev has been participating in several fora and working groups of the Alliance. In addition, in cooperation with two regional laboratories, EnDev modified the existing Water Boiling Test procedures specifically for charcoal stoves. This procedure allows assessing charcoal stoves according to defined quality standards set by the GACC. EnDev also contributed to the revision of the guidelines for evaluation of cookstoves (IWA guidelines) that were agreed in the workshop in The Hague in 2012. Additionally EnDev supports the

formulation of standards and test procedures to be approved by the International Organisation of Standardisation (ISO).

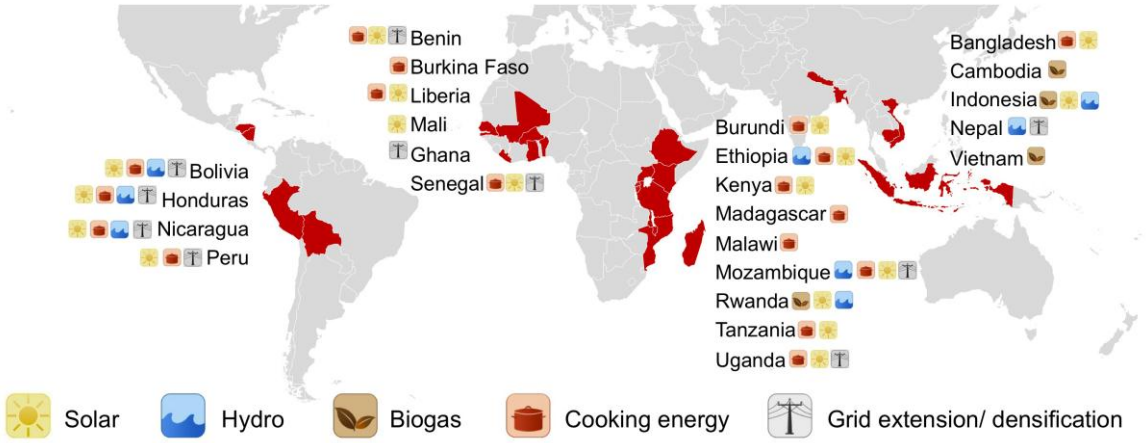
- The **World Health Organisation (WHO**), especially the Public Health, Social and Environmental Determinants of Health Department: the WHO plays a key role in defining safety values for indoor air emissions of stoves and in recommending measures to reduce the health burden of smoke from cooking with biomass. EnDev and WHO established an intensive dialogue about critical values for emissions, strategies to promote improved stoves, and complementary measures to reduce smoke.
- The **European Union Energy Initiative-Partnership Dialogue Facility (EUEI-PDF):** EnDev has been in regular information exchange with EUEI-PDF regarding the energy access situation in individual countries, project activities, innovative approaches and access indicators. Both sides support each other in the preparation of missions and in general policy dialogue issues concerning energy access. EnDev was also involved in the PRODUSE project, which is based on collaboration between the Energy Sector Management Assistance Programme (ESMAP), the Africa Electrification Initiative (AEI), EUEI-PDF and GIZ. PRODUSE provides practical guidelines on the design and implementation of activities to boost productive use of energy.
- **Practical Action:** EnDev and Practical Action have both been part in the international discussion on defining access and indicators. Both sides were regularly exchanging their views and concepts on energy access. EnDev supported the publication “Poor People’s Energy Outlook” with special focus on productive use of energy supply.
- **SNV:** SNV has become an implementer of EnDev projects in five countries. As a consequence, SNV and EnDev started to harmonise their monitoring systems for documenting and verifying outcomes in the field of energy access. For some technologies (solar lanterns, stoves, and biogas plants) both sides developed approaches to enhance pro-poor markets including the use of Results-Based Financing. EnDev and SNV updated each other regularly about country activities, approaches and plans including during several international and bilateral workshops.

# C. Achievements of EnDev 2

## C.1 Number of projects and regional distribution

In 2013, the Energising Development Partnership programme consisted of 26 projects in 24 countries (Figure 1).

**Figure1: Regional Distribution of the current EnDev Projects**




16 of the 24 countries where EnDev is active are least developed countries (LDCs). Africa is still the prioritised continent of the programme, where EnDev is implementing projects in 15 countries, followed by Asia with five countries and Latin America with four countries. The strong focus on least developed countries and Africa is also reflected in the allocation of financial resources. African countries are receiving 57% of the funds, Asia 23% and Latin America 20% (Figure 2). Out of the EUR 168.7 million allocated to country projects, 64% will be spent in LDCs (Figure 3).

**Figure 2: Total funding by regions**

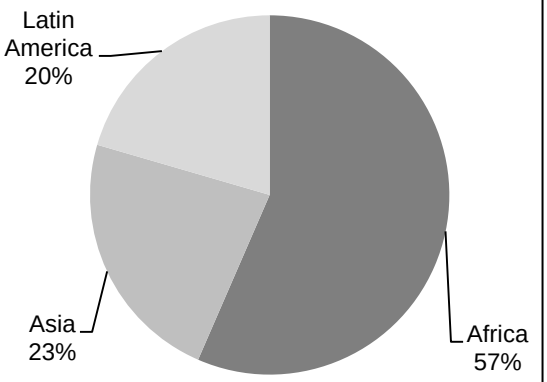
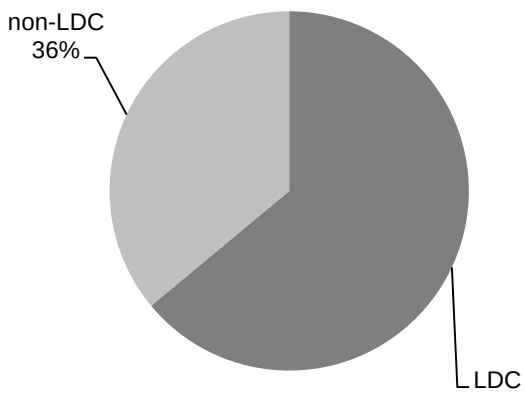



**Figure 3: Total funding by countries**

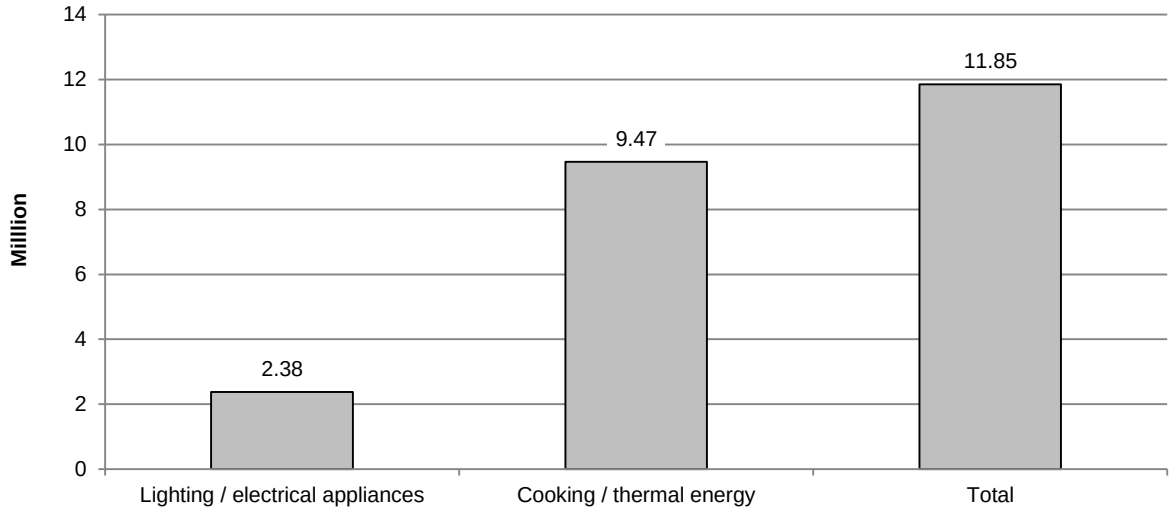



## C.2 Achieved number of persons

By Dec 2013, 11.86 million household members gained access to electricity or improved cooking technologies under EnDev 2. Out of this figure, 2.38 million people were connected to a grid / mini-grid or are benefiting from a solar home system or solar lantern. The remaining 9.47 million people gained access to improved cooking energy, when households acquired an energy-efficient improved cookstove or installed a domestic biogas plant or a

solar water heater (see Figure 4).[3] In addition, 10,300 schools, health centres, and community centres got access to improved cooking energy or electricity, or other modern energy carriers. Also, 26,300 small and medium enterprises now have access to a modern form of energy for productive use.

**Figure 4: Reported number of household members gaining access to modern energy services**




When assessing the outcomes, it is important to consider the sustainability of the achieved access as well as windfall gain effects, and the fact that some of the households might have had already access to electricity or improved cooking technologies before the programme's intervention. These effects are discussed in more detail in the following section.

EnDev activities are aimed at establishing or enhancing sustainable markets for affordable energy technologies, fuels and services adapted to the needs of the target population. Thus, one of the key activities of EnDev projects is to train and support local manufacturers in technical and business skills. However, not all of the manufacturers trained stay in business. Especially in the case of stoves where profit margins are low, up to 50% of trained stove producers leave this business after the support of the project ends, illustrating weak market structures at the bottom of the pyramid. In case of solar systems and hydropower plants, households and communities may not be able or willing to maintain the service or technology for a longer period of time due to shortage of money or external risk factors (e.g. natural disasters), which cannot be mitigated by development actors. These losses of access are not easily compensated through market forces. Consequently, the number of people having durable access to modern energy services is generally lower than the number of people who initially had modern energy services during the programme. This is, in particular, the case for devices that have a short lifespan and require frequent maintenance. Depending on technology or provided services, as well as the attractiveness and lifespan of the devices and services **a sustainability adjustment factor (SAF)** is applied. In a few cases as for grid extension and hydropower, when calculating the number of people with a sustainable access to modern energy the number does not decrease but increase. This is caused by people moving into villages with grid electricity as they also want to benefit from the new infrastructure. Therefore, a small growth adjustment factor is applied for these specific cases.

[3] Figures do not add up due to double EnDev factor (see below).

The **windfall gain factor (WGF)** takes into account that some households benefit from support and subsidy measures of the EnDev programme, although they would have gained access to modern energy services anyway. For instance, a significant percentage of households in Bangladesh would acquire a solar home system even without any support from the project but of course they take advantage of the subsidy schemes provided by EnDev.

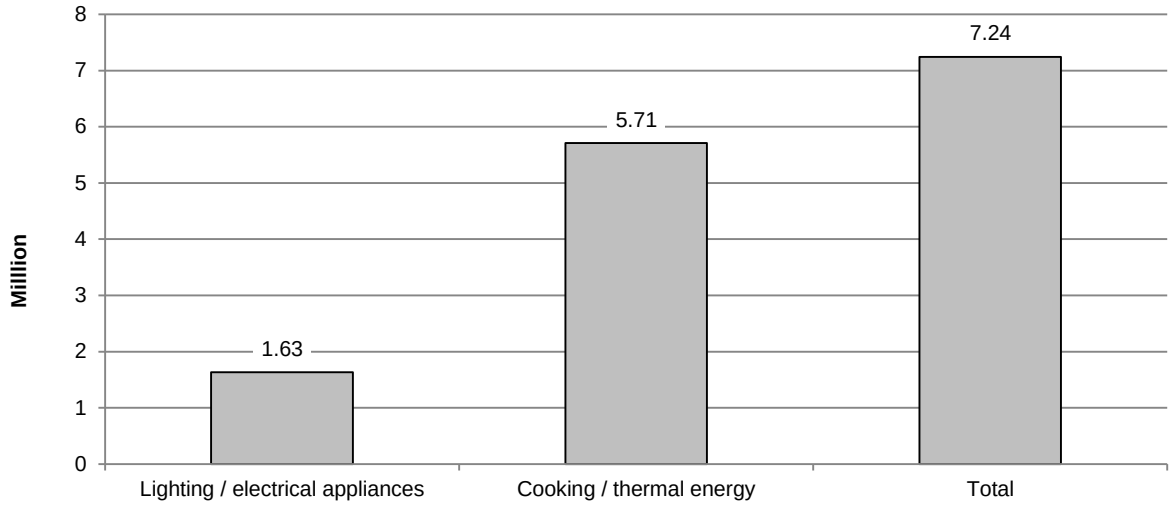
The third adjustment factor, the **double energy factor (DEF),** is applied in those cases where households, social institutions and enterprises have access to the same type modern energy already (electricity or clean cooking technology). Quite often households use different types of technologies in parallel, such as LPG and three stone fire or kerosene lamp and electric lanterns. In those cases households will only be counted as having access to modern energy services if the traditional, unhealthy technology was the primary, dominating one.

**adjusted number of people = number of monitored beneficiaries - (SAF, WGF, DEF)[4]**

When reporting combined figures for electricity and cooking energy, a "double EnDev factor" is applied in addition to the reductions mentioned above. This factor ensures that households benefitting from both modern cooking energy and electricity through the EnDev programme are only counted once in the overall figure.

When applying these different adjustment factors, the total number of people who gained access to modern energy services in a sustainable way under EnDev 2 is 7.24 million: 5.71 million with stoves / biogas / SWH and 1.63 million with electricity (Figure 5).

**Figure 5: Adjusted number of household members gaining access to modern energy services in a sustainable manner**




**The total number of people gaining sustainable access to modern energy services on the household level through the EnDev programme (phase 1 and 2) is 12.26 million.**

**In addition 15,700 social institutions and 28,300 small and medium size enterprises got access to electricity or modern cooking technologies.**

[4] As SAF, WGF and DEF are expressed in percentages, the actual formula used is: adjusted number of people = number of monitored beneficiaries × (1-SAF) × (1-WGF) × (1-DEF)

EnDev aims at achieving a ratio of one to two between electrification and stove outcomes. Currently, the share of people with new access to electricity is 22% of all beneficiaries. Main reasons why the share of electrification in the global outcome figure is growing slower than expected are:

- High costs of electrification technologies and services for end users in comparison to improved cookstoves
- Unattractive tariff settings for mini-grids
- Change of government policy and commitments, such as reduction of public spending for micro hydro plants
- Bureaucratic administrative processes for procurement of goods and licencing procedures
- Lack of investments in renewable energy technologies
- Poor quality of products spoiling the market (solar systems)
- High import taxes for renewable energy technologies

**Electrification outcomes according to different access levels**

In the Progress Report 2012, the outcome figures for electrification were already classified according to different levels of access. For picoPV systems, EnDev counted less than an entire household as gaining access to electricity, depending on the technical performance of the system. This is justified as small picoPV systems only partly cover a household's energy needs.

When the Global Tracking Framework (GTF) of the SE4ALL initiative was published, the EnDev counting system was changed to align it with the tracking framework. Thus, the outcome figures in the last Annual Planning 2014 document were based on the GTF tier system. The GTF tier system for electrification is widely accepted for the higher service levels but contentious for the lower levels. Especially the classification of solar lanterns has caused an ongoing discussion and will most probably be revised in the near future.

The GTF system is currently based on the assumption that Lighting Africa certified solar lanterns will fully meet a household's electrical energy needs. However, this is often not the case: Lighting Africa certification covers only quality standards and does not establish a minimum performance level (brightness, run time, availability of power for mobile phone charging and other services). Consequently, there is a growing consensus that certain lighting systems, especially task lighting, should be counted on a per person and not on a per household basis. Still controversial are the minimum standards: EnDev has established a minimum standard for light of 150 lumen-hours and will only count a person as having access to electricity if enough power is left to charge a mobile phone or to operate a radio. In this and the coming reports, we return to a system counting households only partially in tier 1 until a revised version of the GTF is approved.

Based on this system the EnDev electrification outcome figures in the different tiers are as follows:

| tier | 1[5] | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| outcome | 85,369 | 1,005,824 | 134,522 | 180,075 | 227,078 |

[5] For its outcome target, EnDev is counting only a fraction of the above-mentioned persons within tier 1, as battery charging and picoPV usually do not supply a full household (average 5 persons).

| tier | terminology | people counted | description of services | proxy indicator ≥ kWh / person / year | typical supply system |
|---|---|---|---|---|---|
| 5 | full | 1 household | tier 4 services + use of devices *typically requiring several kilowatts, such as air conditioners* | 1000 | grid |
| 4 | advanced | 1 household | tier 3 services + use of devices *typically requiring a kilowatt, such as water heaters, irons, vacuum cleaners* | 400 | grid with frequent power cuts |
| 3 | moderate | 1 household | tier 2 services + use of devices *typically requiring a few hundred watt, such as rice cookers, refrigerators, freezers* | 100 | mini-grid |
| 2 | basic | 1 household | bright light, use of radio and telephone + *other devices typically requiring some tens of watts, such as TV, video, fan, computer* | 10 with LED / *CFL*, 20 with incandescent or unknown lamp | SHS etc. |
| 1 | partial | between 1 person and 1 household, depending on services offered (minimum 150 lumen hours and energy for radio and cell phone) | medium bright light + *possibly limited use of radio / cell phone* | 1.50 | picoPV, battery charging stations |

### Cooking energy outcomes according to different access levels

The development of a tier system for cooking energy is considerably more complex. In contrast to electric energy, a significant improvement of the quality and quantity of cooking energy services does not necessarily depend on the switch from one energy carrier (biomass) to another (LPG or electricity). For the vast majority of households in developing countries, biomass will continue to be the main fuel for cooking in the foreseeable future. The degree of access to modern cooking is also determined by the type and quality of the stove and the cooking environment (mainly ventilation).

The current system published in the SE4All tracking framework is focussed largely on the type and quality of the stove and its use. However, the tier system of the tracking framework for cooking has considerable flaws and shortcomings and cannot be fully implemented with reasonable effort. The defined standards for the four main technical dimensions to measure the quality of cookstoves are: (1) energy efficiency, (2) emissions, (3) indoor air quality, and (4) safety. These are not so easy to measure, and it requires costly equipment. Also, they do not reflect the different dimensions of the cooking system well enough. Therefore, EnDev currently works on a tier system which will take into account: a) quantity and quality of fuel, b) quality of the stove, and c) cooking environment. The system will be ready at the end of 2014. In parallel, we continue to contribute our experiences and ideas to the tier discussion of the Global Alliance for Clean Cookstoves and the SE4All initiative.

## C.3 Impacts

EnDev aims at ensuring that people in developing countries get access to modern energy services. Combined with this outcome it is intended to:

- increase the efficiency of the use of cooking and lighting energy sources in benefitting households;
- reduce indoor air pollution;
- reduce health problems related to the use of traditional energy services, especially for women and young children, who are most affected;
- reduce climate-damaging emissions;
- reduce deforestation;
- develop and strengthen pro-poor markets for improved cookstoves and off-grid solar products;
- generally improve people's living conditions.

The monitoring and reporting system currently in place for EnDev focusses on measuring the number of people provided with modern energy services, the energy efficiency of the promoted energy technology or service, the turnover of involved companies and the reduction of greenhouse gas emissions. In an ad-hoc and limited way, projects report on the direct benefits of having access to energy services as well, such as cost savings, improvement of the health situation, better educational conditions and opportunities for income generation.

In addition to the regular reporting, impacts of EnDev are studied through baseline studies, impact assessments covering specific topics, mid-term reviews and ex-post evaluations. The findings of the studies are also used to confirm or improve the adjustment factors, which are applied to the reported outcome figures.

In 2013, three studies / reports initiated in 2012 were finalised. In addition, 18 new studies / reports were initiated, 14 of them are completed. The studies cover electrification as well as stove projects in ten countries. A comprehensive overview of the achieved impacts of the entire programme was published in the second edition of the EnDev Report on Impacts (EnDev, 2013).

Furthermore, EnDev is closely following the international discussion and is regularly evaluating publications on impacts of access to modern energy services. In 2013, two reports were published that reviewed studies and existing literature on impacts of access to electricity:

a) The evidence of benefits for poor people of increased renewable electricity capacity: literature review; Ana Pueyo; Institute of Development Studies, 2013
b) Renewable energy: access and impact; IOB study no. 376, Ministry of Foreign Affairs of the Netherlands, March 2013

Major findings of both publications are incorporated in the following chapters on the impact of EnDev activities.

### Increase the efficiency of the use of the primary energy source

**a) Stoves:** In 2013 EnDev tested the efficiency and safety of promoted stoves. Reports of these tests are available from seven countries: Benin, Burkina Faso, Bolivia, Liberia, Madagascar, Malawi, and Tanzania. Stoves not saving at least 40% of energy compared to the baseline technology in the "Water Boiling" and "Controlled Cooking" test or not fulfilling basic safety standards were not included in the adjusted number of outcomes. However, they are not necessarily excluded from project activities because they often have positive impacts on indoor air pollution and work load, even if they don't reach 40%.

Several field studies have shown that households quite often do not realise the energy-saving potential of the improved cookstoves fully. The main reasons are that a) households tend to cook more (more often or bigger meals), b) do not use the appropriate cooking pots and c) do not use the stove in an optimal way, e.g. do not extinguish the fire in the stove but let it smoulder for a longer period of time. It is a general phenomenon of many innovative technologies that the benefits achieved under controlled conditions are frequently offset by human behaviour and traditional habits. As a consequence of these findings, EnDev uses only an average reduction of fuelwood consumption of 30% per improved cookstove in its outcome calculations and reporting regarding $CO_2$ emission savings.

In several countries, households cook on various types of stoves in parallel. They do not immediately switch from one stove to another or from one fuel to another, but they add the new stove or fuel to the already existing ones.[6] Thus, an improved cookstove will not necessarily completely replace the three-stone fire. The different stoves and fuels are used for different purposes. The traditional fire is often used especially for small meals, like breakfast. Only over time traditional cooking technologies are abandoned if they are not needed anymore. For our impact analysis we assume that on average improved cookstoves will be used for 80% of the meal preparation.

**b) Lighting systems:** EnDev is almost exclusively promoting Compact Fluorescent (CFL) and LED lamps for lighting that produce a brightness of 60 or more lumen per Watt. These lighting systems are 300 times more efficient than a candle and a kerosene wick lamp (0.2 lm / W).

### Reduction of indoor air pollution and health impacts

Lighting and cooking with traditional devices using solid fuels is the cause for fire accidents and indoor air pollution. Acid smoke and deposits of soot in the lungs are causing serious respiratory diseases. The WHO now even estimates that household air pollution from cooking with solid fuels kills 4 million people annually.[7]

**Stoves:** Improved cookstoves promoted by EnDev reduce indoor air pollution in general and also diminish the exposure of household members (particularly women and children) to toxic emissions. These effects are driven by three factors: firewood savings, improvement of burning processes (resulting in reduced smoke emissions) and introduction of chimneys for specific stove types. As mentioned above, EnDev assumes an average reduction of fuelwood consumption of 30% in calculations. Open fires in three-stone stoves result in an incomplete combustion leading to emissions of complex mixtures of pollutants such as particulate matter of different sizes (PM, including black carbon), carbon monoxide, nitrogen dioxide, volatile organic compounds including benzene, and polycyclic aromatic hydrocarbons. It is calculated that the emissions of these substances will be reduced by 42% assuming a 30% reduction of fuelwood consumption due to improved burning processes. This is confirmed by a study from Kenya which compared traditional three-stone fires and improved cookstoves: in the case of improved cookstoves, CO levels in kitchens were 33% lower and personal CO exposure was 42% lower. Chimney stoves reduce in-house emissions and emission exposure down to almost zero.

Up to now, there is no clear picture whether the reduction of indoor air pollution through the use of improved cookstoves without chimney is sufficient to decrease the incidence of certain diseases. In several studies people reported through interviews that they had less health problems as a result of less smoke produced by an ICS when compared to a three-stone fire.

[6] See also Renewable Energy: Access and Impact, IOB study 376, www.government.nl/foreign-policy-evaluations.

[7] Lim S.S et al. 2012, A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010, Lancet, 380: 2224-60.

Other studies did not find evidence that improved cookstoves without chimney have any beneficial health impact, as the indoor air pollution is still too high. According to a review study carried out by WHO, advanced solid fuel stoves reduce the concentration of pollutants by more than 30%. However, the levels of PM generally remain well above the WHO threshold. Studies about the health effect of 130 million improved biomass and coal stoves in China showed that even when the WHO standards were not met, the risks of lung cancer, chronic obstructive pulmonary disease and acute lower respiratory infection decreased.

A higher reduction of indoor air pollutants is achieved when using a stove with chimney, smoke hood or flue hood. Thus, a substantial reduction in exposure to indoor air pollution and a reduction of respiratory symptoms, headaches and eye infections have been demonstrated several times for chimney stoves.

Significantly greater air quality benefit can also be achieved by cooking outdoors or in locations with sufficient ventilation and separated from the main living rooms. Further, certain behaviour changes reduce the exposure to smoke, such as extinguishing fire when not in use, fuelwood drying, using pot lids to reduce cooking time, and moving children away from the cooking area. These findings advise EnDev to follow a more integrated approach when promoting cookstoves.

Among fuelwood-using households, the vast majority of persons responsible for cooking are women (>90%). A study in Burkina Faso revealed that in 14% of the households the woman is carrying a baby at her body while cooking takes place, and in 29% of the households a child under six years often stays close to the stove. Therefore, especially women and young children benefit from reduced indoor air pollution.

**Electric light:** Kerosene lamps emit carbon monoxide, carbon dioxide, sulphur dioxide, nitrogen dioxide, formaldehyde, various volatile organic compounds and particulate matter of different sizes. The exposure to toxic gases often exceeds international standards for ambient air quality. Exposure to emissions of lamps affects more family members as in the case of stoves, and occurs over longer time periods (several hours per evening). Children are most vulnerable to the emissions since PM inhalation can hamper lung development. Kerosene lamps are also one of the main causes of fire accidents.

Electric light can prevent these negative health impacts. In addition, it improves people's safety while in the dark (e.g. against thefts, snakes) and hygiene within homes. In several studies families noted a decrease in the dirtiness of the walls and reported that they clean their houses more often.

In some countries it is observed that the baseline for lighting is slowly shifting from kerosene and candles towards low-quality lanterns powered by non-rechargeable batteries. Although people might reap short-term benefits in terms of hygiene and health, the batteries disposed in the natural surroundings pose a new environmental threat which may result in negative effects on human health in the long run.

Electric power is important for any well-functioning health care system. It enables clinics to refrigerate vaccines, sterilise medical equipment, provide lighting in wards and operating theatres, and make use of communication equipment. In 2013, EnDev assessed the impacts of the electrification of health centres with PV systems in Ethiopia. All electrified health centres are now open 24 hours a day. Prior to this, only few health centres offered nightly emergency services. The provision of health services was generally limited to the phase between sunrise and sunset. People use the new night service, especially women, as the outside lighting makes them less afraid to visit the centre at night or in the evening darkness. The number of deliveries at night doubled in those centres that had an emergency service. In addition, 80% of the health centres now offer inpatient service compared to 40% before the electrification. The installation of the PV system has also resulted in improved laboratory services, such as better diagnosis of tuberculosis, malaria and HIV with the help of electric microscopes and refrigeration of test kits. The number of vaccinations also increased. Vaccines as well as medical drugs can now be preserved without major losses. Health staff and patients reported that the quality of treatments had improved dramatically due to better

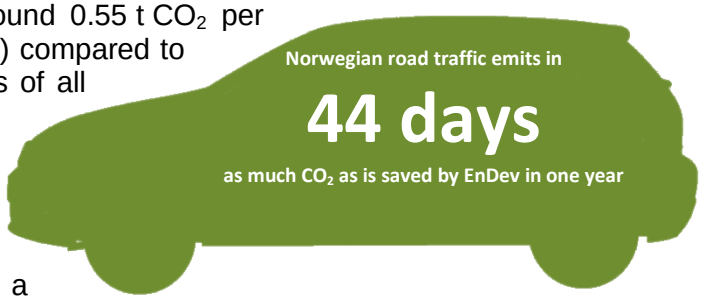
lighting. Surgical interventions were much safer and easier with electric lighting, and hygiene in the clinic had improved, resulting in reduced risk of infections. The report also notes that solar electrification has helped retain qualified health staff in the rural post, and has reduced cost of lighting and charging of mobile phones, which clinic staffs need in order to communicate. As a consequence of the improved service, health centres now have more clients and are economically more viable. The results of the EnDev impact study in Ethiopia confirm similar findings from a study in Ghana not related to EnDev interventions mentioned in the last progress report.

However, an EnDev study in Honduras demonstrated that the impact of the electricity access in the health sector depends on the availability of the electrical equipment. If health centres are not adequately equipped, the improvement of services is not so pronounced.

Electrification through grid extension, mini hydropower plants or photovoltaic installations helps to reduce waste problems by decreasing the demand for small dry cell batteries. Used batteries are usually discarded in the local environment as toxic waste without further treatment. However, special attention must be paid to the proper disposal of the solar batteries, a process that is still in its infancy in many project regions.

### Climate-related impacts

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 1,168,636 t of $CO_2$. This figure includes 215,863 t $CO_2$ for which emission reduction certificates have been generated and will be 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, mini-grid or grid connections replaces at minimum two kerosene lamps, thus saving at least 0.15 t $CO_2$ per year. A solar lantern replaces approximately 90% of a kerosene lamp, saving 0.068 t $CO_2$ per year.

The total $CO_2$ saving of 2.1 million stoves and access to electricity for 385,000 households supported by EnDev are 1,223,286 t of $CO_2$. [8] This is as much as the Norwegian road traffic emits in 44 days.[9]

### Impact on deforestation and soil degradation

Fuelwood originates from a wide range of land-use systems. These include primary or secondary forests, trees outside forests, agricultural plantations, agroforestry areas and tree plantations. EnDev carried out two studies in Latin America to get a better picture on how much fuelwood is taken from the different types of land plots by the target households. The data from Latin America showed that most of the fuelwood is coming from a sustainable source. A significant part of the fuelwood is collected from small plots of land owned by the respective household. Other parts are collected from forest areas in a sustainable way.

[8] For the time being the $CO_2$ savings per year are only calculated for solar home systems, offgrid hydropower, picoPV and improved cookstoves of EnDev 1 and EnDev 2, which were present in December 2013. The calculation is – according to UNFCCC – based on default values and own assumptions if necessary.
Within EnDev the adjusted outcome figures are used to calculate the $CO_2$ savings. However, the double EnDev factor will not be applied, as both electrical systems as well as improved cookstoves contribute to $CO_2$ reduction.

[9] road traffic emissions in Norway amount to 10.1 million t $CO_2$ (in 2012): www.ssb.no/en/klimagassn

When assessing these results, it must be kept in mind that the studies were carried out in relatively vegetation-rich areas. The degree of sustainability of fuelwood consumption will definitely decrease in densely populated and dry areas.

Several international studies have demonstrated that fuelwood consumption can have significant negative consequences for forest areas. For example, the South African Institute of Physics studied the forest area with an aircraft-based imaging system and a light detection and ranging system to calculate tree height by scanning the area with an airplane-borne laser and measuring the time it takes for the light to return to the aircraft. They found that under current consumption rates, the fuelwood in the communal areas of Lowveld, South Africa, would be totally exhausted within 13 years. They also showed that the number of households using fuelwood would need to be reduced by 15% a year during eight years, before biomass stabilises to a sustainable level. Studies with similar results for other areas in Africa have been published by the World Bank and FAO. Thus, there is no doubt that modern and clean energy services with improved energy efficiency contribute to the reduction of deforestation but the magnitude has to be investigated in more detail in the EnDev projects.

**Development of pro-poor markets**

For the development of self-sustaining markets it is essential that sales figures of energy products and services reach a critical mass of customers and sufficient turnover, allowing enterprises to stay in business on the medium and long term. Based on this concept, calculations were carried out about the total number of sold / installed energy technologies / services, and the corresponding turnover of the involved enterprises (see Figures 6 and 7). According to these data, yearly turnover of local solar markets which EnDev supports reached over EUR 160 million, and the yearly turnover of stove markets reached over EUR 16 million in 2013.

In addition to this, the average monthly turnover of solar retailers increased from EUR 1.4 million in 2010 to EUR 2.5 million in 2013; that of stove producers and retailers from EUR 730,000 to EUR 1,400,000. It is planned to analyse the sales and turnover data at greater detail in the upcoming reporting periods and to continuously assess the market development for different products and services.

**Figure 6: Yearly turnover of markets for solar technologies (not just EnDev)**

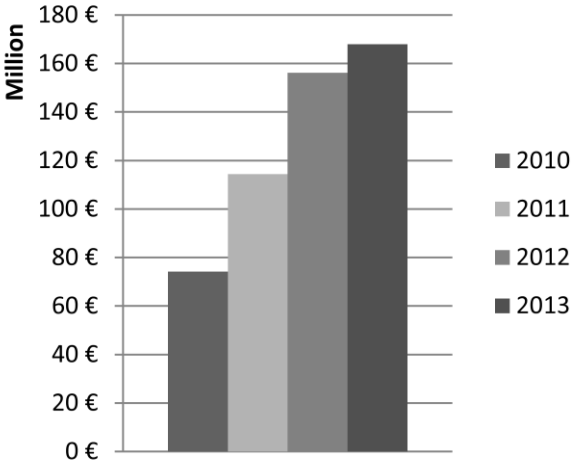
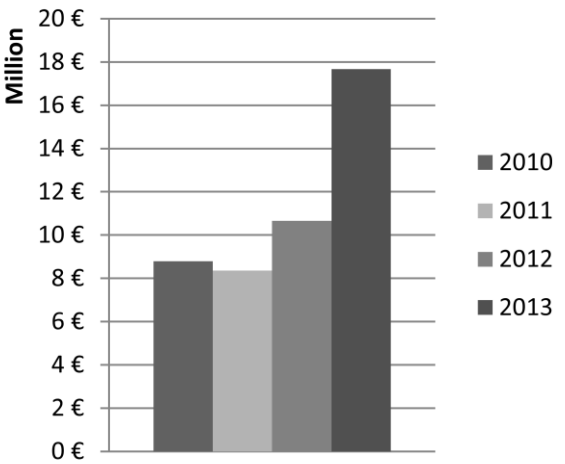



**Figure 7: Yearly turnover of markets for stoves (currently just EnDev)**



### General improvement of people's living conditions

**Impacts on income and employment:** Households with efficient improved cookstoves need less firewood per meal than those without. As a result, these households could save part of their income. Savings can go up to EUR 45 per household per year (for those who buy firewood), but they can also be zero if households use the stove more frequently than the baseline technology or do not use it properly.

A study about biogas in Rwanda found that the systems reduced energy expenditures in households and decreased their reliance on firewood and charcoal. Digester-owning households spent about 30% less money on energy as compared to the control group. This translates to an annual reduction in expenditure of about EUR 60. The reduction in expenditure comes mainly from reduced use of firewood (five kilograms less per day as compared to control households) and charcoal.

Households connected to the grid or using a photovoltaic system drastically reduce their expenditures for kerosene, candles and single-use batteries. However, the overall impact on the family expenditures depends on the amount of the electricity consumed.

For small businesses, electrification makes a significant contribution to economic growth and poverty reduction. A bright illumination of markets and workshops helps to attract new customers, though partly to the disadvantage of businesses without electricity. With access to electricity, businesses can diversify the services they offer and extend their working hours into the evening.

The possibility to recharge mobile phones at home is another major advantage of electrification. It helps expand the use of mobile phones with positive social and economic impacts. Whereas before, frequent travels to visit family members, friends, and business partner had to be undertaken, telecommunication has now reduced the frequency of these visits and made communication easier. People are now much better informed than before. A study in Peru demonstrated that mobile phone expansion increased household real consumption, reduced poverty incidence, and decreased extreme poverty.[10] Phone charging at home also considerably reduces costs, as commercial charging in some countries reaches up to EUR 0.25 for a single charge.

In EnDev's experience, it is very rare for new income-generating activities to arise as a consequence of the new electricity supply alone. Economic development is therefore often restricted to (1) entrepreneurship in providing the energy service itself and (2) electrification of existing businesses. In addition, market access is often a limiting factor. A finding from remote villages in Indonesia illustrates this: even with reliable electricity access from micro-hydro power plants, productive use did not take off because of lack of nearby markets on which the products could be sold.

However, economic development of rural populations is highly influenced by the level of education, the state of health and the general living conditions of households. All of these are positively affected by improved cooking technologies and access to electricity.

### Impacts on education

Children in rural areas, especially girls, often spend a great deal of time on basic subsistence activities, such as collecting firewood. Less wood needed due to an improved cookstove reduces time for collection and increases school attendance. Although access to electricity does not have an immediate impact on the level of education, it influences learning performances by providing adequate lighting for children to spend more time studying and reading late in the evening. In a baseline study in Bangladesh, electrified households stated that they spend 2.26 hours on reading while non-electrified households spend 2 hours. Electricity creates the possibility of accessing information through radio or television.

[10] D. Beuermann et al.(2012): Mobile Phones and Economic Development in Rural Peru; Journal of Development Studies Vol. 48 No11, 1617-1628.

Households at EnDev hydropower sites in Indonesia primarily operate lighting devices, but also use TV sets and other information and entertainment devices like CD or VCD players. They also charge their mobile phones. 81% of households name TV as their major source of information. Ownership and use of mobile phones is significantly higher in electrified households, compared to non-electrified households selected as a control group.

The electrification of schools means that teachers can use computers, televisions and tape recorders: a significant contribution to the quality of the education system (sometimes critical to attract teachers and keep them in rural areas). In addition, adult education in the evening hours becomes possible. However, these impacts only materialise if the school administration purchases the necessary electrical equipment.

**Workload**

Women often have a high workload as they have to shoulder the double burden of field work and the bulk of household responsibilities. Therefore, women can often spend less time than men on education. Their workload also reduces women's opportunities to engage in productive activities, condemning them to economic dependence. The improved cookstove activities help to address these issues. Almost all interviewees of a survey in EnDev Kenya's improved cookstoves project claim to have saved time on wood collection and cooking. Half of the respondents who saved time use this additional time to carry out their productive activities. About a third of the respondents saving time were doing leisure instead (going to the church, visiting family members, etc.).

In some countries women have become stove entrepreneurs, thus improving their social position, and enhancing their roles within families and villages.

Electric light gives women the freedom to do some of their housework after dark, so they have more time to relax, to study or to do other work during the day.

## C.4 Some lessons learnt from failures and challenges

**There is strong concern that several mini-grids supported by EnDev may not be sustainable on the medium and long run:** EnDev has supported so far more than 500 mini-grids. The majority of them (344) are based on hydropower, the remaining on photovoltaic-diesel hybrid systems. In several surveys conducted by EnDev to assess the sustainability of sites, the percentage of non-operational sites varied between 15% and 25%. Several reasons for non-operation were identified, among them: technical failures (turbine, electronic devices), civil works problems, reduced water flow in dry season, and the national grid having reached the village. Technical and civil works problems are often the result of poor maintenance and a failure to handle problems and initiate repairs at an early stage. EnDev addresses these challenges by placing strong emphasis on high-quality technical design and supervision of construction, as well as by providing training to operators and the community. Nevertheless, the success of capacity building measures depends on individual initiative and commitments of community members and operators. In addition, the financial capacity of the community or the individual operator is often too low to make additional investments in the power plant or grid. Not all operators keep detailed and meaningful financial records. Only few have an adequate tariff system, allowing for sufficient savings in order to ensure long-term operations and handling equipment failures. The revenues of mini-grids are further limited by a low degree of capacity utilisation. Many hydro power plants owned and operated by communities run only a few hours per day. Generally a capacity utilisation of minimum 70% is needed to operate mini-grids in a financially sustainable way and at affordable tariffs. This level is often achieved if an anchor client or business customers constantly consume a considerable share of the power production.

**Many households neither maintain energy devices properly nor replace them in due time:** As was pointed out already in the last report, households continue to use their stoves

even if the stoves are seriously damaged and malfunctioning. In addition, there is a broad variation among households in the intensity of maintenance of stoves. We have observed the same phenomenon with other energy devices. For example, EnDev supported the installation of solar cocoa dryers in Liberia. The solar dryers have been highly welcomed and are intensely used, with the result that farmers received a higher price due to the improved quality of the beans. Despite this clear economic advantage, farmers do not pay much attention to maintaining the dryers, so that first damages were observed which were not repaired in due time. EnDev plans a training campaign to make people aware of the need to maintain the devices.

**Activities involving construction measures and requiring permission processes by public regulatory authorities often face serious delays, making a sound scheduling almost impossible:** In some countries EnDev supports grid extension and the installation of mini-grids in cooperation with the local utility, the respective regulatory bodies and the ministries responsible for energy. In two countries the activities are delayed by more than a year and it is still not foreseeable when they will be finished. Several reasons for the delay were identified which are typical for this kind of activities in several countries: quite often the initial planning is done on an insufficient database; tendering and procurement procedures are difficult, time- and resource-consuming; procedures for customs clearance and tax exemptions of imported material are highly complicated; construction and service companies are selected too slowly and not in a coordinated way; the respective authorities are often bureaucratic and slow in preparing and approving contracts with companies. Because most of the decisions are outside the influence of EnDev, it is extremely difficult to present a reliable plan with clear milestones and time schedules.

## C.5 Current lessons learnt of the Results-Based Financing (RBF) facility

EnDev's RBF facility has made good progress in 2013. The projects selected under the first tranche have started to define the exact terms of the RBF scheme and the details for the contractual arrangements with implementing partners, financial institutions and the private sector. While some countries advance as planned (Tanzania, Rwanda, Vietnam), in other countries processes are delayed by difficult contractual set-ups, limited capacity of actors involved or the worsening political situation in the countries. Details are given in the respective country sheets.

In parallel, the preparation and management of the second round of RBF projects was initiated and will continue with the full proposals being presented in April, and project preparation and commissioning taking place in the second half of 2014.

The start-up of the first round of RBF projects already brought up some relevant lessons:

- It proved to be quite challenging to define an adequate level of financial incentives that are on the one hand attractive enough to stimulate investments and participation of the private sector, but on the other hand do not create false price expectations among customers regarding the future price level of certain products. Therefore, several projects decided to take a stepwise approach: start with an incentive considered to be adequate but allowing a rectification of this incentive after six to twelve months.
- Another challenge is to find the right balance between a purely commercial market approach and the ambition and need to reach the poor. For example, some projects decided to link the size of the incentive to certain quality and service parameters like brightness and lighting duration (lumen-hours). There was some concern that this may negatively influence market development as it discriminates against cheap low-service products, which serve as market entry products, and favours more expensive high-service products. However, from a pro-poor market perspective, it makes sense as it enables poor households the access to high quality products at affordable prices especially in rural areas, where prices for high-level products are out of reach. The price reduction expected over the course of the RBF implementation allows poor

households to benefit from high-service products several years earlier than they would under non-RBF market conditions.

- There have been some discussions whether the use of the incentive should be targeted or restricted. The current RBF concept foresees that the recipient of the RBF is free in using the subsidy for whatever purpose. The incentive can be used to reduce the product price or as indirect subsidies to finance marketing activities or reduce transaction costs in rural markets. Indirect subsidies are often preferred from a market development perspective, if price reductions cannot be ensured for a longer period of time or scaling effects are not expected. However, any restriction in using the RBF limits the flexibility of the recipients to invest the funds in a way they consider most appropriate. EnDev will analyse the use of the incentives and feed this information in the general evaluation of the RBF approach. First results from Tanzania indicate that the private sector, on their own accord, will refrain from using RBF incentives to directly reduce end user prices. Only one out of eleven private sector applicants proposed the use of incentives to influence consumer pricing. The most commonly proposed use of the incentive by the private sector applicants is awareness creation through advertising paired with re-investment in capacitating and/or financing sales agents networks.
- Normally, incentive schemes are designed to stay in the market for a longer period, building up the confidence of market actors and allowing all levels of the supply chain to develop. (As it is the case for example with feed-in schemes.) Very much to the contrary, the DFID RBF concept foresees a very rapid approach. The time horizon for the EnDev RBF to stay in the market is four years. This is considered too short for markets to develop from scratch. Ideally, the RBF will lift a nascent market to the next sustainable level. The short time horizon of the RBF combined with the pressure to achieve a high amount of people gaining access to electricity might create misguided incentives to provide subsidies for energy access markets that are already developing on their own; and therefore, will not benefit from the subsidies based on the RBF incentive.

# D. Country activities

## Bangladesh

| | | | |
|---|---|---|---|
| **Promoted technology** | solar / stoves | | |
| **Project budget** | EUR 14,064,000 | **Spent until reporting date** | EUR 8,699,052 |
| **Project period** | 06.2009 – 06.2017 | **Reporting period** | 12.2013 |
| **Lead political partner** | Bangladesh Ministry of Power, Energy and Mineral Resources | | |
| **Implementing organisation** | GIZ | | |
| **Implementing partner** | Solar: Infrastructure Development Company Limited (IDCOL), Stoves: Joint Project Management Unit of GIZ / Ministry of Environment and Forests | | |
| **Coordination with other programmes** | Renewable Energy and Energy Efficiency / Sustainable Energy for Development – SED (BMZ); GEF, KfW, IDA, GPOBA (DFID), GPOBA (SIDA), ADB, WB through IDCOL | | |

| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 1,976,294 | 901,167 | 1,361,962 | people[11] |
| Cooking/thermal energy for households | 680,000 | 804,727 | 2,187,719 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 0 | 0 | 0 | institutions |
| Energy for productive use / income generation | 0 | 0 | 0 | SMEs |

### Project strategy and key components

EnDev Bangladesh has supported the dissemination of solar home systems (SHS) through programmes of the Infrastructure Development Company Limited (IDCOL) since 2003. The programmes provide commercial partner organisations with a financial loan and grant package for them to be able to offer the systems to households at acceptable monthly instalments. EnDev and other donors funded grants which are partly used to reduce the product price for rural households and partly to improve rural distribution systems. Since 2010, EnDev Bangladesh has supported Small Solar Home Systems (SSHS) exclusively. IDCOL is responsible for contracting and monitoring the performance of more than 40 partner organisations in the dissemination of SHS/SSHS. The introduction of SSHS (10 to 30 Wp) into the programme was initiated and piloted by GIZ with EnDev support in 2007. Subsidy support for SHS has decreased since the inception of the programme and has been phased out entirely by the end of 2012. SSHS on the other hand were still supported by EnDev until the end of 2013.

EnDev is now preparing a Results-Based Financing scheme to support the introduction of even smaller PV systems, called picoPV (1-10 Wp), to the market on a large scale. picoPV systems fulfilling defined quality and output requirements will be eligible for a financial incentive paid after the sale of the system. The approach will be similar to the one

[11] Due to a change in picoPV counting (see chapter C.2) figures of the previous reporting period are not directly comparable to current outcome figures.

successfully implemented for SHS/SSHS, yet in contrast to it, the amount of subsidy will depend on the system's lighting performance and output in lumen hours. As IFC/Lighting Global has begun activities in Bangladesh in early 2013, constructive discussions on collaboration and alignment of approaches have been taken up since the middle of the year. The expectations of both sides towards the market are very similar and the prospects are good regarding a close cooperation in the market building efforts in Bangladesh.

In the field of improved cookstoves (ICS), EnDev is working with NGOs and Small and Medium Enterprises which produce and sell energy-efficient stoves (Bondhu Chula) to households all over Bangladesh. EnDev supports the training of trainers of stove builders and sales/marketing staff; it involves local women for marketing of ICS; and introduces quality assurance and monitoring mechanisms. The project has successfully completed its first phase in cooperation with the Ministry of Environments and Forests (MoEF). The ministry provides a subsidy for the stoves for different target groups (BDT 250 general, BDT 500 for poor households and BDT 700 for poor freedom fighters[12]). The second phase of cooperation with MoEF is planned to kick off mid of 2014.

## Project progress (overall progress towards outcome target EnDev 2)

In total, more than 1.7 million SHS and 0.9 million SSHS have been sold and supported under the IDCOL-driven distribution system between 2003 and the end of 2013.

The average sales figures in 2012 and 2013 indicate further growing market activity especially in the segment of SHS. While in 2012 the sales figure of (still subsidised) SSHS were on average around 19,000 systems per month, this number more than doubled to over 39,000 during 2013. In the segment of unsubsidised SHS, the figures remained rather stable and were on average about 33,000 in 2012 and 36,000 in 2013 respectively.

Overall, sales of more than 53,000 SHS and 237,000 SSHS have been supported with EnDev 2 funds between August 2010 and December 2013. Based on the national average of 4.5 people per household, this accumulates to 1,361,962 people benefitting from access to solar electricity through the contribution of EnDev.

EnDev counts 5 % of IDCOL's SHS sales since funding was phased out (December 2010), considering that other organisations also contributed to the development of the market.

Regarding the RBF scheme supporting the market development of picoPV products, discussions are ongoing with IDCOL to define the precise incentive mechanism and the size of the financing. Recently, IFC also joined this discussion with their Lighting Global programme. It is expected that all open questions will be clarified in the coming weeks, allowing an official start of the RBF in April or May.

In the intervention area of ICS, over 300,000 stoves have been disseminated through 5,300 SME partners during the current reporting period starting from 01 July 2013 to 31 December 2013. Of the total systems, over 55,000 were sold to Vulnerability Group Development (VGD) Card Holders, households that are exceptionally poor and receive support from governmental programs with a subsidy of BDT 500. Poor freedom fighters receive special support as well; the BDT 700 subsidy was disbursed over 7,000 times within this period.

Spot checks have been conducted for 5.5 % of the stoves. Around 491 stove promoters and 1088 promotional women volunteers are working hand in hand with the SME partners.

[12] EUR 1 = BDT 107 (31 Dec 2013).

Since the stoves are made of concrete, the lifespan is expected to be well over three years. However, since an evaluation of the effects of deterioration has not been conducted, a minimum value (in this case three years) will be considered until a comprehensive durability test is carried out.

Due to the rapid growth of stove dissemination, monitoring has become more challenging for a limited number of monitoring staff (currently 15) on the ground. However, data quality has been improved already and impact monitoring will be strengthened in the near future.

Over the course of the last year, 151 households were interviewed as part of impact monitoring surveys: 51 % of respondents claimed their health condition has improved; 81 % of participants use fuelwood as their main fuel; and 68 % use only an ICS for everyday cooking. Average cooking time also decreased by one hour after using ICS compared to a traditional stove. As the survey methodology was not entirely adequate, these values can be taken as an indication at best, but not as representative for the programme. A more detailed analysis will be conducted and a tablet-based survey system will be implemented over the next year. Besides measuring progress and impacts, the analysis is intended to contribute to the overall knowledge about both stove and solar markets.

### Sustainability and handover strategy

Demand and sales figures for SHS are expected to remain high; no further support from donors is needed. In the case of SSHS, subsidies have decreased over time and were supposed to phase out by the end of 2014. However, IDCOL and DFID have initiated a further cooperation in this regard and will continue to provide a buy-down grant of USD 20 for systems under 30 Wp for another 1.1 million units. Whether this development will affect the sales of picoPV systems under the EnDev picoPV project is to be seen. However, the prices of systems on the lower end of SSHS and the upper segment of picoPV systems are currently expected to achieve about the same pricing level (in both cases after subsidy) of BDT 8,000-12,000.

While potential suppliers of systems are establishing their offices in the country, concerns prevail regarding the market opportunities of the more expensive but high quality picoPV systems. While savings could be achieved on the long run, the initial investment is too high for rural households to afford. Similar to SHS / SSHS, the approach for picoPV is thus to stimulate the market through a combined loan and subsidy scheme to reduce the initial investment burden, and to reduce subsidies when the market is developing, when technological advances as well as scale effects lower the retail price of systems. IDCOL expressed the wish to further picoPV activities using its extensive countrywide supplier structure once the technology has proven itself on the market.

For ICS, a direct incentive has been introduced by the GoB through the Ministry of Environment and Forests (MoEF), which is envisaging further allocations to support the ICS dissemination process through a buy-down grant. The direct involvement and effort of the GoB to provide ICS to poor households in Bangladesh (and their goal to cover 100 % of all households by 2021) reflects the importance of this technology in Bangladesh. Further EnDev activities will aim to involve further partners and organisations, training stove builders, promoters and marketing staff, supporting quality assurance and product development, in order to stabilise the market and introduce a wider variety of products.

# Benin rural electrification

| | | | | |
|---|---|---|---|---|
| **Promoted technology** | solar / grid power | | | |
| **Project budget** | EUR 7,160,000 | **Spent until reporting date** | EUR 1,655,036 | |
| **Project period** | 10.2009 - 06.2017 | **Reporting period** | 12.2013 | |
| **Lead political partner** | Ministre de l'Energie, des Recherches Pétrolières et Minières, de l'Eau et du Développement des Energies Renouvelables (MERMEDER) | | | |
| **Implementing organisation** | GIZ | | | |
| **Implementing partner** | Société Béninoise de l'Energie Electrique (SBEE), Agence Béninoise pour l'Electrification Rurale et la Maitrise de l'Energie (ABERME) | | | |
| **Coordination with other programmes** | ACP - EU-Energy Facility, Agence Française de Développement (AFD), BMZ - GIZ Agriculture Programme, BMZ - GIZ Decentralisation Programme and BMZ - GIZ Water Programme | | | |
| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
| Energy for lighting / electrical appliances in households | 406,415 | 7,202 | 7,202[13] | people |
| Cooking/thermal energy for households | 0 | 0 | 0 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 100 | 58 | 58 | institutions |
| Energy for productive use / income generation | 100 | 53 | 53 | SMEs |

## Project strategy and key components

**Grid extension and densification:** EnDev Benin r.e. targets grid extension and densification of village grids through a cooperation with the national utility Société Béninoise de l'Energie Electrique (SBEE) within an EU-EF, AFD and BMZ co-financed programme. The project provides and is responsible for technical assistance in all stages of the project (e.g. planning, tendering, reception, procurement and intermediate storage of construction material, supervision of construction work, quality control). The co-financed programme aims to achieve access for 220,000 people (16,800 connections) in 105 villages. A proportional 18,429 people will be accountable to EnDev.

Follow-up visits in EnDev1 villages revealed that many additional secondary connections of low quality and poor safety have emerged. These were not created nor encouraged by the project and are a source of energy losses and considerable safety risks for the population. Therefore, the grid component of EnDev Benin was scaled up in May 2013 to transform at least 5,000 secondary connections to meet technical standards of approved primary connections. New connections will be created with little additional investment. Additionally, awareness about security issues among the target group and energy provider will be raised and training modules for local electricians developed. In some villages, low-voltage lines will be extended if larger groups of the population can be reached with small budget.

[13] Due to a change in picoPV counting (see chapter C.2) figures of the previous reporting period are not directly comparable to current outcome figures.

**RBF for PV products:** Under the DFID-funded RBF facility within EnDev, this project implements a four year project with a budget of EUR 3.06 million, which aims to develop the PV market through incentives. These incentives are disbursed for the sale of quality products to the distributing companies as well as users in the case of solar streetlights and solar pumps. Incentives will only be given after sales figures are independently verified. The RBF incentives will enter the market in 2014.

## Project progress (overall progress towards outcome target EnDev 2)

EnDev Benin r.e. faced slow progress in all its components for different reasons given below. At country programme level, a change in management generated an addition challenge to the execution of the program.

**Grid extension and densification:** So far, 7,202 people have been reached with access to electricity through an increase in connections in villages electrified under EnDev 1. For the EnDev 2 villages, progress is still slow. While the majority of the medium-voltage grid is finalised, no household connections have been accomplished by the end of 2013, in spite of earlier planning and expectations. Main reasons are difficulties caused by time and resource consuming tendering and procurement procedures. In addition, there was a seven months delay for confirmation of construction contracts by national authorities. Most of these factors have been beyond EnDev's control.

**RBF for PV products:** A baseline study is being prepared to clarify the present market situation. At the same time, relations have been built with all actors present in the market today. An operational concept for the RBF incentivisation of picoPV kits and lanterns has been elaborated and the referring contractual model is in last stages of preparation.

## Sustainability and handover strategy

Already in EnDev 1, preparatory measures carried out by NGOs before electrification proved to raise connection densities and customer understanding, therefore improving the chances of sustainability. Furthermore, since EnDev 1, no disconnections have been reported by SBEE, which is an indicator for sustainability. However, experience from the 12 village project (EnDev 1) has shown, SBEE does not densify the grid or increase the connection rate within villages already connected. This is partly addressed by the new densification component which ensures formalisation and safety of secondary connections and supports additional connections that can be achieved with limited investment.

# Benin stoves

| | | | | |
|---|---|---|---|---|
| **Promoted technology** | stoves | | | |
| **Project budget** | EUR 4,000,000 | **Spent until reporting date** | EUR 2,090,490 | |
| **Project period** | 10.2009 – 12.2014 | **Reporting period** | 12.2013 | |
| **Lead political partner** | Ministry of Agriculture, Breeding and Fishery | | | |
| **Implementing organisation** | GIZ | | | |
| **Implementing partner** | Ministry of Energy, Petroleum and Mine Research, Water and Renewable Energy Development | | | |
| **Coordination with other programmes** | Promotion de l'Agriculture (ProAgri / GIZ) | | | |
| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
| Energy for lighting / electrical appliances in households | 0 | 0 | 0 | people |
| Cooking/thermal energy for households | 800,000 | 622,151 | 940,995 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 0 | 18 | 23 | institutions |
| Energy for productive use / income generation | 0 | 0 | 26 | SMEs |

## Project strategy and key components

In EnDev 2, the Benin stove project called FABEN (Foyers Améliorés au Benin) has three main components: (1) a significant increase in promotional activities for improved fuel wood and charcoal cookstoves (ICS) in new intervention zones in order to push stove sales of the producers trained so far; (2) a focussed consolidation and extension of production capacities in the new intervention zone to ensure quality stove production and to address additional markets not yet targeted in these areas; and (3) a continuation of phasing-out from the EnDev 1 intervention zone in order to prepare producers and customers for their long term self-reliance as market actors. The EnDev stoves programme in Benin is also part of the regional cooking energy programme ProCEAO (12/2011 - 12/2014), which is co-financed by the EU.

## Project progress (overall progress towards outcome target EnDev 2)

Overall, FABEN has increased its outcome by 51% as compared to the last reporting period and has actually reached 118% of its new target. Substantial growth of stoves sales in all three geographical intervention zones contributed to this result.

Component 1: The sales records indicate that promotion tools applied by FABEN to support producers and retailers helped to raise stove sales to a new peak due to market-based interventions. A study revealed that 95% of producers and 99% of the retailers believe that the media campaign has increased their income. As a result, they own more assets (78%), are able to support extended families (52%), and improve their food security (30%). The stove buyers rated the "awareness raising demonstrations" (80%) to be the most influential marketing instrument, followed by radio shows/ commercials (61%) and public events (49%).

Component 2: Since the expansion to Cotonou and Porto Novo last semester, the field staff deployed there contributed through awareness raising demonstrations, increasing the Éclair

stove sales by 52%. In this intervention zone, located along the ocean, some users are complaining about mid-term damages, particularly on the charcoal holding grill. These damages emerge due to the high salt content of the humid ocean air. Options for addressing these observations will be developed in future éclair design revisions.

Component 3: In the initial EnDev 1 areas, stove sales have increased by 30% compared to the last quarter due to the promotional activities undertaken in component 1. The producers associations are prepared to play a key role in the promotion, storage and bulk sale of improved cookstoves, in the organisation of public events, in the quality control of stoves and the protection of the label Anfani. A first batch of producers received several trainings in business management, marketing- and business plan development. Furthermore, a regional association for the production of metal stoves has been put in place to create economies of scale and ensure the availability of metal sheets by aggregating purchases.

Particular attention has also been given to the promotion of the new Éclair charcoal stove. A total of 12,056 stoves were sold in Benin during this second semester, an increase of 28% from the previous semester. Its sales accounted for 54% of all metal charcoal stove sales reported this semester by FABEN. The U.S. Environmental Protection Agency and Winrock International invited Berkeley Air to conduct a household-based study on emissions and fuel consumption, comparing the performance of the Éclair vis à vis a baseline stove. On fuel use, the Éclair stove used nearly 55% less energy per standard adult meal during this study, which is a substantial reduction. Regarding emissions, the CO emissions of the Éclair were significantly lower than those of the baseline stove, though still not reaching WHO indoor air standards. However, it was pointed out that these stoves were used exclusively in the open air.

In the ProCEAO intervention zone in Benin, 49,012 people have been reached with ICS since the beginning of the intervention (approx. 54% of the target).

## Sustainability and handover strategy

An increase of stove sales by 50% within a six months period is highly unusual. While it is a huge success of the marketing interventions of the project, it also constitutes a risk that these high levels might not be sustained when EnDev is phasing out its support to the sector. There is a threat that sales levels will drop faster compared to a slower growth path strategy, an aspect which will remain under observation. FABEN's activities regarding its sustainability strategy focus on the following elements:

(1) Improving profitability of stove producers through FABEN's technical and business trainings, business plan elaboration support and semi-industrial production support;
(2) Promoting a high demand for stoves through FABEN's attractive branding; continuing networking workshops with suppliers, producers, retailers, users, banks and public agents; building capacities of producers and retailers in carrying out marketing activities; and furthering the access to financial products adapted to the needs of stove users;
(3) Enhancing a supportive political framework and social environment for stove markets through lobbying and awareness raising of NGOs, public institutions and the population;
(4) Reducing market vulnerability through the establishment of partnerships, securing access to quality clay, aggregating raw material purchases, etc.; and
(5) Increasing capacity of the national research institute in standardisation and quality control of modern stoves through technical trainings and provision of equipment.

Due to the progress made, and the availability of remaining funds, a cost-neutral extension of the program until 12/2015 is suggested.

# Bolivia

| | | | |
|---|---|---|---|
| **Promoted technology** | solar / stoves / hydro / grid | | |
| **Project budget** | EUR 11,400,000 | **Spent until reporting date** | EUR 8,297,784 |
| **Project period** | 10.2009 – 06.2016 | **Reporting period** | 12.2013 |
| **Lead political partner** | Ministry for Hydrocarbons and Energy (MHE), Vice Ministry for Electricity and Renewable Energy (VMEEA) | | |
| **Implementing organisation** | GIZ | | |
| **Implementing partner** | Vice Ministry for Electricity and Renewable Energy (VMEEA), NGO's, municipalities, utilities, communities, cooperatives. | | |
| **Coordination with other programmes** | PROAGRO (BMZ), Program Electricity to live with dignity - PEVD (Government Program), Inter-American Development Bank - IDB | | |

| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 400,000 | 191,297 | 209,887[14] | people |
| Cooking/thermal energy for households | 237,000 | 223,103 | 234,225 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 2,700 | 1,999 | 1,954[15] | institutions |
| Energy for productive use / income generation | 11,200 | 8,574 | 9,691 | SMEs |

## Project strategy and key components

The strategy is demand-driven and based on the principle of mobilisation of local resources (financial, human, material) with direct participation and involvement of beneficiaries and/or implementing partners at different government levels.

The project's main activities continue to focus on co-financing energy access and developing local capacities with the following key components:

- Design of policies and co-financing mechanisms to grant access to energy.
- Support for producers / retailers / providers in the supply of modern energy products and services (training and advice).
- Support of awareness and PR campaigns about indoor air pollution, productive use of energy, proper use of natural gas and safe domestic electric installations.
- Facilitate and support networking between stakeholders in the energy sector.

All components are integrated into the M&E system. The system is currently transitioning to the Latin American online monitoring platform spearheaded by EnDev Peru.

## Project progress (overall progress towards outcome target EnDev 2)

### Grid connections for households and social infrastructure

EnDev supports grid densification through formal alliances with Bolivian utilities. In addition, EnDev started working with regional governments (Chuquisaca and Oruro) to complement their grid extension activities with densification (in the framework of a larger programme

[14] Due to a change in picoPV counting (see chapter C.2) figures of the previous reporting period are not directly comparable to current outcome figures.

[15] This figure goes down slightly because of replacement of stoves from EnDev 1 (end of lifespan).

financed by the IDB). In December 2013, new agreements were signed with the utilities of Cochabamba, Santa Cruz, Potosi and Chuquisaca for implementation in 2014.

Technical assistance / capacity building was provided for a decree regulating the introduction of renewable energy systems (on-grid / off-grid). In alliance with VMEEA/IDB, six projects were developed in the Amazon region (three hybrid power plants, three picoPV projects).

**picoPV for households**

EnDev and VMEEA carried out a pilot project on distribution and financing of picoPV systems in the northern Amazon region, disseminating 1,800 systems in total. In the last moment however, the government changed the agreed strategy and removed the beneficiaries' co-financing requirement. As sustainability is unclear, these systems are currently not reported.

**Improved cookstoves for households and social infrastructure**

EnDev supported the construction of more than 9,000 stoves through a strategy of direct implementation by local NGOs and companies. In parallel, the strategy of building Malena stoves with co-funding from municipalities continued; approximately 15 municipalities will include a stove subsidy in their 2014 budget.

The Stove Testing Centre participated in an event in Honduras aiming to discuss, exchange and harmonise approaches on laboratory setup, equipment and tests. This support is also part of EnDev Bolivia's contribution to the GACC.

**Solar energy for social infrastructure**

This component has changed its strategy, eliminating direct subsidies and focussing on technical advice. Alliances with government institutions from the health and education sectors have been pursued. In Oruro, four municipalities invested in systems for 17 social institutions (probably more in the future). The health service of Potosi has requested technical assistance from EnDev for PV or thermal systems for up to 300 health centres. EnDev launched the "Olympic Games for Knowledge", focussing on the knowledge of teachers and pupils about maintenance, and reaching over 60 teachers and 2,000 students.

**Productive use of energy**

The number of municipalities contributing financially to PU projects within EnDev rose by 30%. The involvement of municipalities, their financial contributions and the participation of municipal technicians in the process will contribute to sustainability. EnDev started working with a microfinance institution, providing technical assistance to farmers wishing to acquire energy-demanding technologies through a micro-credit. An agreement has been signed with a major utility to encourage grid extension and/or installation of transformers for SMEs.

In collaboration with GIZ/PROAGRO, EnDev works towards a NEXUS project that will bring together the energy and agriculture sectors. EnDev will provide technical assistance to a national programme focussing on drinking water and micro-irrigation projects.

## Sustainability and handover strategy

EnDev has provided technical assistance for a national decree that will enforce a national norm for improved cookstoves. A study on use, maintenance and replacement of Malena Stoves has been conducted. The study will be published in early 2014; the results will be used for strategy adjustment. EnDev supports the VMEEA and the National Electricity Authority with technical assistance to introduce regulations that will require all future grid extension projects to provide electricity meters as well as other connection components to the households connected. The Stove Testing Centre was awarded a grant from the GACC in order to strengthen capacities and broaden the scope towards a larger variety of analyses.

# Burkina Faso

| | | | |
|---|---|---|---|
| **Promoted technology** | stoves | | |
| **Project budget** | EUR 3,500,000 | **Spent until reporting date** | EUR 2,353,885 |
| **Project period** | 10.2009 – 12.2014 | **Reporting period** | 12.2013 |
| **Lead political partner** | Ministry of Environment and Sustainable Development | | |
| **Implementing organisation** | GIZ | | |
| **Implementing partner** | Government institutions, business associations, NGOs, Institut de Recherche en Sciences Appliquées et de Technologie (IRSAT) | | |
| **Coordination with other programmes** | SNV stove program, PASES (World Bank) stove program, UNIDO stove Program | | |

| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 0 | 0 | 0 | people |
| Cooking/thermal energy for households | 500,000 | 362,915 | 426,335 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 1,000 | 1,604 | 2,053 | institutions |
| Energy for productive use / income generation | 6,000 | 1,630 | 2,471 | SMEs |

## Project strategy and key components

The EnDev Burkina Faso stove project called “Foyers Améliorés au Burkina Faso” (FAFASO) has eight components: (1) the further expansion of stove production and promotion in new villages and towns; (2) the consolidation of already existing supply-demand systems in the rural areas; (3) networking with producers in Ouaga and Bobo to ensure high performance after the phasing-out of project support; and (4) piloting the Éclair charcoal stove technology, if found appropriate.

A particular focus is the promotion of large-scale cooking devices for (5) social institutions and (6) commercial applications such as restaurants, beer brewing and shea butter processing. The named commercial activities are large consumers of firewood with a high potential for wood savings.

In addition to the promotion of efficient cooking devices, (7) the piloting of fuelwood tree plantation and (8) the introduction of fuels based on agro-waste are key interventions on the fuel supply side.

## Project progress (overall progress towards outcome target EnDev 2)

In the last semester, FAFASO reported a decrease in outcomes for the first time in its existence. This trend has been reversed in the current reporting period. Stove sales are up by 26% overall compared to the last report, with 40% increase in rural areas and 13% increase in cities. This result is also higher than both semesters of 2012. One core reason for the recovery is a better monitoring of the stove sales. Other reasons for the recovery are:

1. FAFASO has engaged in numerous national events in order to increase the public awareness about both products and producers. New programmes have come on board, like World Bank/PASES, Entrepreneurs du Monde etc. Their public awareness interventions are also benefitting the producers of EnDev.

2. Regarding rural areas, the reason for the drop of sales was partially the collapse of the monitoring system due to changes in personnel, but also due to low purchase power of the target group caused by the failed harvest. Both problems have been overcome in the meantime. On the one hand, the new harvest was much better; and on the other, due to the up-scaling, an increased number of field officers strengthened the promotional and monitoring activities, being well linked to both producers and users. Both effects contributed to an increase of 40% compared to the stove sales in the previous semester.

In some regions the production of ceramic stoves has at least come back to its former 2011 level. Even if the production difficulties caused by continuous problems with the kiln technology still persist, FAFASO's technical assistants have managed to stabilise production and boost sales.

The new Éclair (charcoal) stove was sold at small levels (84 units). Users' feedback is positive, but the design will be further adjusted based on feedback from users and producers in early 2014. Subsequently, PR activities will be intensified (TV spot, national launching event).

The establishment of several metal stove producers organisations has progressed. The procedure has been slowed down by administrative (yet often turned political) problems, e.g. to get titles for the land where the production centres are to be installed.

The army of Burkina Faso has decided to equip their camps with improved cookstoves. This will further boost the results for social institutions. While in this category the indicator will be strongly over-fulfilled, the achievement for productive use of cooking energy is still behind the expectations. It has become clear that the potential for these products has been overestimated in the preparation of the up-scaling proposal.

FAFASO has supported the reforestation of 22 ha with some 13,750 trees in August 2013. This activity has been conducted mostly in partnership with wood consumer organisations (beer brewers, shea butter producers) and the Ministry of Environment and Sustainable Development.

## Sustainability and handover strategy

FAFASO selected the best-performing rural producers association to pilot the handover strategy in the rural areas. Promotional and transport materials have already been purchased. The handover will be done in the first quarter of 2014 after conventions of use and maintenance have been established and signed. A new specialist has been recruited particularly to support the associations and enhance their cooperation with the financial sector.

## Further information

The development in the regions covered by EnDev-EU-co-funding (ProCEAO) in Burkina Faso is satisfying and the result is around 65% of the target after two thirds of the project period. The linkages between the activities for EnDev and ProCEAO in Burkina Faso are currently under assessment.

# Burundi

| | | | |
|---|---|---|---|
| **Promoted technology** | solar / stoves | | |
| **Project budget** | EUR 1,500,000 | **Spent until reporting date** | EUR 808,813 |
| **Project period** | 09.2010 – 12.2014 | **Reporting period** | 12.2013 |
| **Lead political partner** | Ministry of Energy and Mines (MEM), Ministry of Environment in D.R. Congo | | |
| **Implementing organisation** | GIZ | | |
| **Implementing partner** | DGHER - General Directorate of Water and Rural Energies FSTE (Fond de Solidarité des Travailleurs de l'Enseignement); stove producers, private sector | | |
| **Coordination with other programmes** | UNICEF, CATALYST (IFDC), ADLP (GIZ), ACCESS (GIZ) | | |

| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 11,000 | 3,553 | 1,025[16] | people |
| Cooking/thermal energy for households | 120,000 | 10,260 | 10,260 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 12 | 3 | 3 | institutions |
| Energy for productive use / income generation | 150 | 27 | 27 | SMEs |

## Project strategy and key components

EnDev Burundi facilitates access to modern energy services for households, SMEs and social institutions in Gitega and Mwaro provinces. The project cooperates with the GIZ Decentralisation and Poverty Reduction Program (ADLP) that operates in the same target regions. EnDev Burundi consists of two components: solar PV and improved cookstoves.

Solar PV: The project bases its PV strategy on 131 Solar-Multi-Service-Stations (SMSS) that offer a range of services, such as phone and battery charging, hair cutting and electricity for neighbouring SMEs. EnDev Burundi started a pilot of 10 SMSS as "selling points" for picoPV systems. This figure was later amplified to 27 and this model was applied gradually to the remaining 104 SMSS. This way EnDev Burundi has the unique opportunity to offer (1) interested picoPV importers an already existing distribution channel with 131 sales points, (2) the SMSS owners additional income and (3) the rural population access to energy services and to high quality picoPV systems.

ICS: EnDev Burundi will build up on the measures of the first cooperation with IFDC to implement an approach focussing on the creation of self-sustaining ICS markets in four centres in Burundi and two in South Kivu, DRC.

## Project progress (overall progress towards outcome target EnDev 2)

During the reporting period, EnDev activities focussed on the installation of the remaining 101 SMSSs. The previously slow speed was caused by delays in the procurement process

[16] Due to a change in picoPV counting (see chapter C.2) figures of the previous reporting period are not directly comparable to current outcome figures.

and quality issues of the delivered materials. Additionally, the small project team suffered again from unforeseen health-related absence of key staff.

EnDev is in the process of establishing links between picoPV distributors and the SMSSs, with the SMSSs serving as local selling points. Three picoPV distributors are currently cooperating for a small trial with 10 SMSS. The main obstacles encountered so far are the limited number of quality products available in the country, especially on the low-price range, as well as the limited financial possibilities of the target groups. EnDev Burundi will address both challenges by increasing its efforts in getting new appropriate products onto the Burundian market and creating financing possibilities together with the micro-finance sector. EnDev already started a partnership with FSTE (Fond de Solidarité des Travailleurs de l'Enseignement), a micro-finance organization for teachers, to provide financing services for solar systems. If this collaboration turns out to be successful, this partnership could serve as a best practice example and be extended to other financial organisations.

In the area of energy for social institutions, EnDev Burundi identified a high demand from local communities. Despite the 30% upfront cost contribution required from local communities, the demand exceeded the offer by far. Therefore, EnDev Burundi decided to support the sustainable implementation of 23 social institutions. The local tender has been already launched and the project expects all SI to be connected during the first quarter of 2014.

The cooperation with IFDC on improved cookstoves had to be postponed to 2014 due to the unforeseen and long absence of the relevant managers of both EnDev and IFDC. EnDev will start the cooperation on a smaller level than initial planned in early 2014.

### Sustainability and handover strategy

EnDev Burundi strives for sustainability through capacity development, awareness raising, the provision of high quality services and products in the market, and the involvement of the local private sector. Network building is done between actors such as solar companies in Burundi, SMSSs and a pool of technicians, suppliers of quality solar products, micro finance institutions, municipalities, provincial health facilities and education departments, NGOs and government organisations. With all its activities, EnDev Burundi seeks a close collaboration with the local private sector. Unfortunately, this sector is very small and is often lacking necessary capacities. With activities such as regular discussions, capacity building, match making and smaller local tenders, EnDev Burundi tries to support and involve private businesses. Due to the very limited financial capability of households, the project discussed subsidies on a household level but decided against introducing them. Instead, to target financial burdens, the project cooperates with SMSS, importers and the micro-finance sector to provide attractive financing possibilities attached to product warranties.

### Further information

Due to health-related vacancies in the core project team, as well as internal unrest within IFDC, the project is significantly behind schedule. Since December 2013, EnDev Burundi has a new advisor and will try to reach its targets until the end of 2014. Time is seen as the biggest challenge, since the two main activities, picoPV and ICS have to be relaunched.

The demand for additional SMSS is continuously voiced to the project by SME owners. Due to this huge demand, the project will analyse the learnings of this first phase and develop a proposal for up-scaling the SMSS initiative. The current SMSS showcase improved energy services as a business model, through mobile phone charging, selling of picoPV systems, using electricity for hair dressers and connecting up to two other SMEs.

# Cambodia

| | | | |
|---|---|---|---|
| **Promoted technology** | biogas | | |
| **Project budget** | EUR 2,000,000 | **Spent until reporting date** | EUR 533,501 |
| **Project period** | 12.2012 – 12.2014 | **Reporting period** | 12.2013 |
| **Lead political partner** | Ministry of Agriculture, Forestry and Fisheries (MAFF) | | |
| **Implementing organisation** | SNV in cooperation with GIZ | | |
| **Implementing partner** | National Biodigester Programme (NBP) | | |
| **Coordination with other programmes** | IFAD PADEE | | |

| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 13,200 | 307 | 1,136 | people |
| Cooking/thermal energy for households | 45,315 | 1,055 | 3,901 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 0 | 0 | 0 | institutions |
| Energy for productive use / income generation | 0 | 0 | 0 | SMEs |

## Project strategy and key components

EnDev is supporting the National Biodigester Programme (NBP) to establish a self-sustaining, market-driven, national domestic biodigester sector in Cambodia. Key components in establishing this are: to strengthen the private sector; to raise awareness through innovative promotion efforts; to create a credit scheme to overcome the high upfront cost of systems; to support the position of end users through user networks and local technicians; to provide technical assistance alongside the value chain; to seek reductions in the costs of the digesters and appliances; and, to initiate mass transactions of sales, construction and after sales services towards 9,500 biogas installations.

## Project progress (overall progress towards outcome target EnDev 2)

In the reporting period, only 606 digesters have been built. On the one hand, the slow-down and almost standstill of sales and installations at the beginning of this reporting period confirms the vulnerability of the delivery system. On the other hand, a significant number of invaluable lessons have been learned by the operational staff and management throughout the value chain of digesters and along the programme management structure. First signs of recovery are emerging by the end of this reporting phase.

A convergence of market undermining events took place during 2013. Due to a financing gap in early 2013, NBP reduced the subsidy from USD 150 to USD 100. The financial incentives for Biogas Construction Companies (BCCs) and provincial offices were reduced as well. The (campaigning activities in preparation of the) national elections during several months almost brought the country to a standstill. Major floods undermined the construction of digesters. After the elections, the Government introduced a new tax regime pushing the cost of the biodigester to an all-time high. All these factors resulted in a near standstill of digester construction, with many stakeholders in the value chain leaving the sector.

Based on a survey with key actors, NBP considered the reduction of the subsidy to be the core problem of the downward trend. In order to avoid a total collapse of the sector, the subsidy and incentive structure was restored to previous levels by August 2013.

In contrast, SNV believed that the survey method and analysis was insufficient and biased, and that the downtrend was due to a combination of several factors. However, the contract signed between SNV and GIZ was attached to SNV's MoU with MAFF, which in turn makes the GIZ contract a legally binding piece of the MoU with MAFF (as argued by MAFF and NBP). The GIZ contract states that the subsidy level for biodigesters is USD 150; therefore, at an Executive Meeting in July 2013, SNV did not stand in the way of MAFF and NBP making the decision to increase the subsidy level from USD 100 back to USD 150.

While NBP was focussed on doing what they were familiar with to get the programme back on track, the SNV advisor at the time tried to implement the reforms required for achieving what has been agreed to in the contract with EnDev. As a result, the working relationship between SNV and NBP became tense and communication was difficult. The SNV advisor lost the trust of the NBP leadership and could thus no longer influence the course of NBP towards achieving the goals of the EnDev contract.

In order for SNV to rebuild the relationship with NBP and provide the needed advisory services, a new senior SNV advisor was installed in December 2013, succeeding since to restore the working relationship and communication between SNV and NBP. The programme focussed on regaining the trust of people, re-energising the value chain, re-staffing and re-involving partners. Emerging from this difficult period, current activities aim to create new momentum for growth and to advance the overall sustainability by:

- Increasing sales and installations to pre-2013 levels by re-establishing the delivery model that was successful in 2011-12, however with emphasis on market-based elements;
- Field testing cheaper digester models;
- Increasing efficiency of the digester delivery system (promotion, sales, quality of installations, after sales service and customer financing) and introducing regular performance evaluations;
- Ongoing human resource development along the value chain (hiring, training);
- Innovative marketing initiatives (e.g. national TV debate on biodigesters).

Despite all these efforts, it appears challenging to still reach the planned target of 9,500 digesters until the end of the phase. This will be critically assessed in the next semester.

### Sustainability and handover strategy

The long term vision of the programme is still shared by both NBP and SNV (market oriented self-sustaining sector), but the need to contain damage, rebuild infrastructure and increase sales became a first priority for NBP. To do this, they return to earlier ways of operation and in parallel take small steps towards a more market oriented, self-sustaining sector (EnDev objectives). Most of the work reported under project progress is geared towards advancing the sustainability of the sector. NBP's third issuance of carbon funding (for 2012) has been approved - the quickest monitoring process ever. This income is an essential stepping stone for the financial self-reliance of the programme.

### Further information

For more information on the National Biodigester Programme of Cambodia, please visit http://www.nbp.org.kh/.

# Ethiopia

| | | | |
|---|---|---|---|
| **Promoted technology** | solar / stoves / hydro | | |
| **Project budget** | EUR 15,487,000 | **Spent until reporting date** | EUR 10,516,369 |
| **Project period** | 01.2010– 06.2017 | **Reporting period** | 12.2013 |
| **Lead political partner** | Ministry of Water, Irrigation and Energy (MoWIE) | | |
| **Implementing organisation** | GIZ | | |
| **Implementing partner** | MoWIE, Ministries of Agriculture, Health, Education, Environment & Forestry, and Trade; Ethiopian Energy Agency (EEA); Environmental Protection Authority (EPA); Regional Governments/Agencies/Bureaus/ of Energy, Education, Health, Agriculture; Universities / Institutes of Technology (IoT) / Technical Vocational Educational and Training Units (TVET); Chamber of Commerce; Solar Energy Development Association of Ethiopia (SEDA-E); Ethiopian Hydro Power Society (EHPS); Regional (Development) Associations; private solar energy installation & maintenance companies; other private companies in the energy sector value chain; NGOs, Women's Associations; Assistance to Health System Expansion (AHSE); Community Development Service Association (CDSA), Oromia Credit and Saving Share Company (OCSSCO) | | |
| **Coordination with other programmes** | DE: Sustainable Land Management (SLM) Programme, Education Program, National Quality Infrastructure (NQI) Programme, Urban Governance & Decentralisation Program (UGDP); NL: Biogas Programme; Horn of Africa Regional Environmental Centre (HoA-REC); WB: Energy Access and Electricity Access (Rural) Expansion; Lighting Africa; GPOBA; NO: Energy+; IE: Health Care Programme; CIF: SREP-Ethiopia Investment Plan | | |

| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 130,000 | 86,948 | 53,558[17] | people |
| Cooking/thermal energy for households | 925,000 | 495,863 | 543,493 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 800 | 508 | 541 | institutions |
| Energy for productive use / income generation | 2,700 | 2,269 | 2,883 | SMEs |

## Project strategy and key components

EnDev Ethiopia contributes to improve access to energy for poor households based on three types of modern energy services: a) electricity for households, social institutions and small enterprises based on photovoltaic devices / systems; b) electricity from mini-grids based on micro hydropower; and c) energy efficient cookstoves. This approach aims at establishing a market for rural energy products through creation of demand for new products and at the same time at supporting SMEs and setting quality standards for applications such as ICS and solar lanterns.

In addition, EnDev Ethiopia also hosts an ICS RBF facility, starting in Jan 2014.

[17] Due to a change in picoPV counting (see chapter C.2) figures of the previous reporting period are not directly comparable to current outcome figures.

## Project progress (overall progress towards outcome target EnDev 2)

From June until December 2013, in total 51,746 stoves (47,879 Mirt and 3,867 Tikikil) were sold to households. Furthermore, 658 stoves were sold to 30 social infrastructure institutions as well as 1,060 stoves to 607 SMEs for productive use purposes. During the reporting period, 18,828 people gained access to energy from sales of solar home systems (865 p.), solar lanterns (16,967 p.) and from electricity generation through micro hydro power plants (450 p.). Only few additional SIs and SMEs gained access to electricity during this reporting period, but a total of 12,319 solar lanterns were sold to households through private retailers. Due to a new adaptation of the EnDev picoPV counting methodology towards a more conservative approach, the total calculated number of persons who bought lanterns with support from EnDev decreased. If still sticking to the old counting mechanism, the aggregated figure would have risen up to 135,545 – while after the correction only 39,213 persons in total end up being accountable for EnDev. The rate of newly connected households to mini-grids of the hydropower sites increased during this reporting period, which can be interpreted as finally growing confidence into the technology, so that more households dared to invest their earnings after the last harvest period.

The four MHP sites developed with support from EnDev in southern regions are considered as pioneer sites in Ethiopia and are often visited by stakeholders to learn from EnDev's experience. After delegates from MoWIE along with "Japan Micro Hydro Power Developer Plc." visited these sites, the Japanese company has agreed with MoWIE to develop ten low-head MHP in Ethiopia starting in April 2014.

Since the installation of further hydropower plants is highly cost-intensive, the option to upgrade mechanical watermills for production of electricity is now being explored as an alternative activity for EnDev to continue working in the Ethiopian hydro power sector. In cooperation with Jimma University a mechanical watermill in Oromia was selected. Planning and procurement for upgrading the plant has been completed. The Oromia Water Resources Bureau and the Regional Government are now in process to develop a model management modality that could subsequently be applied to other sites as well.

The equipment of health centres with solar energy under the co-financing arrangement with Irish Aid does not only continue, but Irish Aid extended the cooperation with EnDev for one more year – this time also including the ICS sector. Meanwhile, all 25 installations out of the previous funding scheme are completed. However, water drilling complications have not fully been solved and still only half of the planned installations of solar water pumps and water heaters have been realised until now.

PV systems installed at 48 health centres[18] were handed over after implementing technical refreshing trainings for technicians and users. The remaining two health centres could not yet be handed over due to security issues in one case, and due to a required battery replacement in another case. The electrification of community centres with solar installations was enhanced. By demonstrating the advantages of this technology to a larger audience, new potential users shall be encouraged to invest into solar equipment.

EnDev Ethiopia entered various cooperation agreements with other organisations such as Hanger Project, Hope2020, HoA-REC, WFP and SNV to provide expertise both in the ICS as well as in the solar sector.

[18] Out of 50 health centres planned under EnDev 1 but constructed under EnDev 2.

Also during this reporting period, three of the predefined milestones on project progress have been achieved. The milestone for ICS for households (620,983 persons) was again missed due to only limited sales of Tikikil stoves and continuously high deduction of stoves in the counting methodology (because of a large number of stoves surpassed their defined lifespan and thus needed replacement). Previously high Tikikil sales rates were reported due to a large order by UNHCR and WFP for supply to refugee camps, which was not the case anymore during this reporting period. The underachievement of the ICS milestone could however again be compensated by overachievement of the SME milestone by almost 300%. Therefore, the last part of the variable budget will be disbursed.

## Sustainability and handover strategy

EnDev Ethiopia continues to implement training and awareness-raising courses for all technologies, such as solar retailer trainings on both technical and business skills, trainings on production, installation and use of Mirt, Tikikil and IRS stoves, as well as promotion campaigns for the use of ICS. In future, marketing activities will be enhanced specifically with the objective to contribute to better sales rates of the Tikikil stove.

A stove sustainability study has been conducted at the end of 2013. Since the data analysis has not been completed yet, results will be presented in the Annual Planning 2015 document.

In order to safeguard the sustainability of the activities, the project exchanges intensely with Ethiopian government institutions. EnDev is regarded by the GoE as a pioneer in the ICS sector, and experiences gained by EnDev are used for the planning of the large National Cookstove Programme. EnDev and GoE align both programmes through a regular exchange of information.

Sustainability of the hydro power plants seems promising, since discussions with the regional government to take over the long-term responsibility for maintenance and repair are progressing. In view of preparing the handover of the MHP sites, repair and maintenance of MHP sites were carried out (replacement of two bearings of the generator and couplings in Hagara Sodicha and Gobecho 2; repair of generator in Gobacho 1). Moreover, different activities were accomplished to enhance the sustainability of the plants such as auditing of all MHP cooperatives; on-the-job training for cooperative committees on financial management; regular visits to cooperatives and discussions with the cooperative members on tariff models; facilitation of the establishment of a technical committee, which includes Sidama zone cooperative office, Sidama development association and Sidama zone water, mines and energy office.

Sustainability of the solar installations for health centres shall be ensured through a MoU with the regional health bureaus, who commit themselves to be responsible for maintenance and future repair.

In order to support the rural electrification sector in Ethiopia, EnDev continues to facilitate networking fora as means of information and knowledge exchange: Talk Energy Ahead (TEA) and People and Energy Network (PEN) are two informal platforms established to discuss energy issues among GOs, NGOs, private sector, academia and anyone interested in energy-related issues. During the reporting period, two rounds of TEA and three PEN meetings have been facilitated.

## Further information

http://endev.energypedia.info/wiki/EnDev-Ethiopia

# Ghana

| | | | |
|---|---|---|---|
| **Promoted technology** | grid | | |
| **Project budget** | EUR 1,650,000 | **Spent until reporting date** | EUR 1,497,781 |
| **Project period** | 01.2010 – 12.2014 | **Reporting period** | 12.2013 |
| **Lead political partner** | Ministry of Trade and Industry | | |
| **Implementing organisation** | GIZ | | |
| **Implementing partner** | Ministry of Energy, District, Municipal and Metropolitan Assemblies, Local Business Associations, Regional Coordinating Councils, Environmental Protection Agency | | |
| **Coordination with other programmes** | BMZ: Programme for Sustainable Economic Development (PSED) | | |

| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 300 | 975 | 1,023 | people |
| Cooking/thermal energy for households | 0 | 0 | 0 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 6 (electricity connections of SI or zones using street lighting) | 3 (zones using street lighting) | 8 (zones using street lighting) | institutions |
| Energy for productive use / income generation | 600 | 191 | 211 | SMEs |

## Project strategy and key components

In Ghana EnDev continues to focus on the extension of electricity from the national grid to newly established industrial zones. EnDev facilitates a participatory planning process and contributes to the cost of electricity hardware. Local governments contribute by paying for the costs of labour for the installation of the electrical hardware, as well as acquiring and developing suitable land. The local governments also provide additional infrastructure like roads, clean drinking water and toilet facilities. The business associations contribute by providing labour and individual enterprises pay their electricity connection fee. It is also expected that local governments and local business associations will provide streetlights at their own cost to improve security. Under EnDev 2, ownership of the Local Governments is increasingly emphasized for sustainability. The BMZ-financed PSED is supporting the interventions by promoting local economic development activities around the supported zones.

## Project progress (overall progress towards outcome target EnDev 2)

Until December 2013, a total of 211 SMEs and 1023 persons gained access to electricity through EnDev 2 in ten industrial zones. Unfortunately, some mainly women-led enterprises closed their shops due to low patronage and domestic duties. This is partly due to the general economic down turn before and after the 2012 general elections in Ghana.

The zones are at different stages of development: In **Goaso** the industrial zone is operational, with no major developments in the reporting period. In **Kenyase**, the increase in companies at the site is still slow. Decreased customer patronage due to poor road conditions is seen as a main cause. The light industrial area at **Bechem** recorded an

increase in companies. **Berekum** light industrial area experienced a further decrease in companies and employees during the reporting period, yet there was an increase in the number of employees. **Techiman** light industrial area recorded an increase in the number of companies but some other enterprises closed temporarily. In **Agona Nkwanta**, two additional companies have relocated to the site. **Bekwai** recorded a decrease in companies, specifically women food vendors. The connection of some remaining electricity grid components is still pending because the local government lacks funds. In **Agona Swedru**, plot allocations have been done and companies are constructing their structures. In **Sefwi Wiawso**, the site has been connected to the grid and plot allocations to companies have been completed. They are expected to relocate en mass during the next reporting period.

The remaining EnDev 2 zones are developing at a good pace. In 2013/14, three additional industrial zones are being established in three towns – **Asankragwa**, **Obuasi** and **Asamankese**. The electrical hardware has been procured and delivered, installations are in progress. In **Dormaa Ahenkro,** a mechanised borehole and toilet at the site have been commissioned; 43 companies have started working at the site, others will soon relocate. **Enchi** industrial site has recorded two additional companies. Electrical installations have been completed at **Axim, where** plots have been demarcated and allocated to enterprises; a toilet facility is under construction at the site. Installations in Sokoban, **Kumasi** are completed. The Kumasi Municipal Assembly is discussing modalities for allocations with Stakeholders. Installations are completed in **Suhum, the** final connection is expected soon, plot allocations are now in progress. Installations are yet to start in **Nsuaem**. This is because a private person has claimed ownership of the parcel of land that was allocated by the traditional authority. The local government has initiated a process to resolve this issue.

As of December 2013, 864 companies were established in the light industrial zones. 300 of the 864 (35%) companies at the light industrial zones are considered to have acquired electricity access for their companies, either because they are a start-up, or they did not have an electricity connection at their old location.

## Sustainability and handover strategy

In the reporting period, the project stepped up follow-ups, while training focal persons in monitoring of outcomes as part of the exit strategy. EnDev Ghana will continue pursuing an institutional partnership with the Ghana Skills Development Initiative (GSDI) and the National Board for Small Scale Industries (NBSSI) to establish a home for environmental and business trainings.

Local governments face financial constraints in achieving their goals in the establishment of industrial areas. Beyond the policies, manuals etc., resources need to be mobilised. In the next period, the project will be holding discussions with the Ministry of Trade and Industry and the Rural Enterprise Project III (co-financed by IFAD and AfDB) on how they would operationalise the broader concept of Light Industrial Area Development as a key requirement for the provision of Rural Technology Facilities (RTF).

## Further information

Extended version of the country sheet is available on the EnDev-Wiki.

# Honduras

| | | | |
|---|---|---|---|
| **Promoted technology** | solar / stoves / hydro / grid | | |
| **Project budget** | EUR 5,630,000 | **Spent until reporting date** | EUR 4,469,986 |
| **Project period** | 10.2009 – 12.2014 | **Reporting period** | 12.2013 |
| **Lead political partner** | Instituto de Conservación y Desarrollo Forestal (ICF) | | |
| **Implementing organisation** | GIZ, HIVOS, BUN-CA | | |
| **Implementing partner** | Communities, NGOs, AHPROCAFE, ENEE | | |
| **Coordination with other programmes** | Scaling Up Renewable Energy Programme - SREP, GIZ-FOPRONH | | |

| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 26,000 | 19,982 | 19,982 | people |
| Cooking/thermal energy for households | 148,300 | 27,843 | 29,908 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 475 | 127 | 127 | institutions |
| Energy for productive use / income generation | 500 | 163 | 246 | SMEs |

## Project strategy and key components

EnDev-Honduras is working with local NGOs, local governments and community development programmes under co-financing arrangements between EnDev, partner organisations and beneficiaries. Enabling access to energy is integrated into the organisations' rural development processes. Local management entities are formed at community level and then trained in technologies, organisation and management to support the beneficiaries in the maintenance of the energy systems.

The key components of EnDev-Honduras are: a) household lighting through grid access, micro hydro power and solar home systems; b) energy for social infrastructure; c) improved cookstoves and d) energy for productive use such as: solar coffee and cocoa dryers, improved cookstoves for indigenous pottery, bread baking and sugar cane processing.

## Project progress (overall progress towards outcome target EnDev 2)

A total of 49,890 persons, 127 social institutions and 246 small and medium enterprises have benefitted until December 2013.

**PV for households**: The installation of another 1,100 solar home systems on a nationwide scale, implemented by the partner organization "Hermandad de Honduras", will be concluded in February 2014. On top of these, 220 additional solar home systems will be installed and the beneficiaries will be reported in June 2014. In coordination with the "Non Formal Vocational Training Programme – FOPRONH", extensive five-month training courses will educate participants in photovoltaic energy.

**Micro Hydro Power**: During the second semester of 2013, repairs and technical improvements of four micro hydro power plants were carried out in collaboration with the local partner organisations. In five communities, the administrative, organisational and technical skills of the operators were strengthened. The field evaluations for the development

of eight new pico and four new micro hydro power projects were concluded. It is planned to develop the new hydro projects during 2014.

**Improved cookstoves**: Five projects for the construction of more than 1,800 new Justa stoves were implemented. Two of the projects have been finalised, benefitting 405 households and seven small and medium enterprises. The results for the remaining projects will be reported in June 2014.

To bridge the gap between technology providers and beneficiaries, fifteen craftsmen from four different geographical areas have been trained and certified in manufacturing combustion chambers for the Justa stove. This training will enable the replacement of the most fragile parts of the stove while meeting quality and durability standards. The trainees will further participate in business trainings applying the CEFE methodology.

Another five project proposals for the installation of improved cookstoves, after-sales services and revolving funds have been approved by the Central American Fund for Access to Sustainable Energy and Poverty Reduction (FOCAEP).

**Grid Extension**: The delivery of materials for grid extensions with the Office for Social Electrification of the national utility ENEE (Empresa Nacional de Energía Eléctrica) in 15 communities has been concluded and the installation process is still ongoing. Monitoring and supervision activities are planned for the upcoming months, with final results to be reported in June 2014.

**Productive Use**: Until the reporting date, the construction of 76 new solar dryers for individual coffee producers has been completed. The construction of the remaining solar dryers with the partner organization AHPROCAFÉ will be reported in June 2014.

EnDev has actively participated with its experiences in the planning process of the “Scaling Up Renewable Energy Program” (SREP), financed by the BID-FOMIN programme. The micro hydro approach of EnDev was shared with the trilateral program of USAID – EMBRAPA Brazil – University of Florida.

## Sustainability and handover strategy

Sustainability is based on co-financing arrangements involving beneficiaries’ own contributions of up to 50% of total costs, and local implementation alliances linking key public and private actors. The active participation of community organisations in the development of the activities is fundamental to ensure local empowerment.

Capacity development is also an important aspect of the sustainability strategy. In addition to training courses designed for the installation and maintenance of solar home systems, improved cookstoves and micro hydro, EnDev focusses on capacity building for local service providers for after-sales services and business management.

## Further information

The final version of the Impact Monitoring Report is available in the EnDev Wiki: http://endev.energypedia.info/wiki/Informe_Monitoreo_de_Impactos_-_EnDev_HO

# Indonesia biogas

| | | | | |
|---|---|---|---|---|
| **Promoted technology** | biogas | | | |
| **Project budget** | EUR 1,150,000 | **Spent until reporting date** | EUR 522,514 | |
| **Project period** | 12.2012 – 12.2014 | **Reporting period** | 12.2013 | |
| **Lead political partner** | Ministry of energy and Mineral Resources (MEMR) | | | |
| **Implementing organisation** | Hivos in cooperation with SNV and GIZ | | | |
| **Implementing partner** | Yayasan Rumah Energi (Biogas Association) | | | |
| **Coordination with other programmes** | Indonesia Domestic Biogas Programme (Dutch Embassy) | | | |
| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
| Energy for lighting / electrical appliances in households | 0 | 0 | 0 | people |
| Cooking/thermal energy for households | 20,000 | 1,888 | 3,712 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 0 | 0 | 0 | institutions |
| Energy for productive use / income generation | 0 | 0 | 0 | SMEs |

## Project strategy and key components

The biogas dissemination approach is based on the establishment of a market for domestic biogas installations and accessories. It envisages that a well-informed demand side is linked with a capable supply side that can provide quality products and after-sales services at competitive prices. In addition to the main market actors, governmental, non-governmental and private sector players support market development through policy and implementation coordination, promotion, training and extension, credit provision, R&D and monitoring.

Operating through a decentralised programme structure, local BIRU[19] programme teams provide the coordination and support required to facilitate market development. This includes grooming partners, providing trainings, conducting quality control, channelling investment incentives and monitoring. A national programme unit conducts overall programme coordination and liaison with national stakeholders, including government.

Based on international experiences, it has been estimated that multi-stakeholder biogas sector development requires at least ten years. The approach, described above, aims at developing a sustainable market situation, fostering capable market actors supported by key functions such as human resources, financing, R&D and an enabling policy environment. Hivos, with support from SNV, seeks to institutionalise these functions by building the capacity of public and private sector organisations on biogas technologies, supporting the development of biogas construction agencies, linking micro-credit providers to customers, and developing skilled human resources and training services. Close coordination on policy and implementation with national and local governments, in particular the MEMR DGNREEC, also aims to ensure that they will be able to provide sectoral support such as an enabling environment, coordination, monitoring, standardisation and promotional support.

[19] BIogas RUma, Indonesian for Household Biogas.

## Project progress (overall progress towards outcome target EnDev 2)

It was expected that the programme, which has started in East Java after the Dutch government funds were withdrawn as per 1 January 2013, would deliver 150 biogas units per month. Significant delays resulted not only due to the governmental procurement of materials (as committed in the contract), but also due to the vendor supplying the materials.

Hivos was forced to tap into its own resources to compensate for the late start and extremely late delivery of materials, the last batch being delivered early January 2014. Due to the availability of its own funds, Hivos managed to sustain the production of EnDev digesters. The government allowed Hivos to temporarily replace the missing materials with Hivos-funded materials as of 16 July 2013, the date of the procurement of the biogas supplies. This way, the programme was able to produce 914 digesters during 2013, which is 61% of the intended output of 1,500 units. The total production within BIRU in 2013 (including the 914 EnDev systems) was 3,000. In 2014 the total number of digesters to be constructed in 2014 should be 4,061 (of which 3,086 are EnDev digesters).

Hivos would like to request to be allowed to build EnDev digesters in all current BIRU target areas: West Java, Central Java/Yogya, East Java, Bali, NTB, NTT, South Sulawesi and Lampung.

## Sustainability and handover strategy

Many of the cooperatives in East Java, which also function as Construction Partner Organization of the Indonesia Domestic Biogas Programme (IDBP), find it increasingly hard to find potential biogas users. Previously, they targeted farmers that could relatively easy afford to invest in a biogas digester; but nowadays they have to convince smaller farmers to invest, which is both hard for the farmer and risky for the cooperative, since the cooperative has to guarantee the repayment. Even though the market is not saturated yet, the cooperatives have to market their biogas services intensively.

An important sustainability matter is the role of the government in biogas dissemination. While the government would like to see large numbers of farmers owning a biogas installation, even if they would require a high level or even full subsidy, the IDBP is trying to develop a market-based biogas sector. The idea is to encourage farmers to invest in biogas with the prospect of them paying for these products in the future. It requires strong advocacy for the government to remain on the path of market development, but it is also understood that the national government has to listen to regional desires. The programme is negotiating with local governments to ensure at least a minimum contribution from the farmers. Up to now this has been successful in a number of provinces, but not yet in East Java. The newly established foundation Yayasan Rumah Energi plays an increasingly important role in enhancing the local management and implementation of the biogas programme.

## Further information

The Ministry of Energy and Mineral Resources has kept its commitment to provide matching funds to the committed amount of EUR 395,833, over 50% of which has already been spent.

Credit for most of the farmers in East Java is provided by PT Nestle Indonesia at an interest rate of 0% through their suppliers (the cooperatives, some of which are also construction partners). Bank Syariah Mandira, working together with UNEP in the FACET project, has started to make loans available for biogas digesters for cooperatives and individual farmers at 9% interest. This will expectedly open possibilities to serve more farmers outside the group of Nestle suppliers.

# Indonesia electrification

| | | | |
|---|---|---|---|
| **Promoted technology** | solar / hydro | | |
| **Project budget** | EUR 11,960,000 | **Spent until reporting date** | EUR 8,144,183 |
| **Project period** | 05.2009 – 07.2018 | **Reporting period** | 12.2013 |
| **Lead political partner** | Ministry of Energy and Mineral Resources (MEMR) – Directorate General for New and Renewable Energy and Energy Conservation (NREEC) | | |
| **Implementing organisation** | GIZ | | |
| **Implementing partner** | MHPP2: Ministry of Energy and Mineral Resources (MEMR, DGNREEC), MHP-TSU: Ministry of Home Affairs (MoHA) | | |
| **Coordination with other programmes** | DME (NREEC), DAK (NREEC – local government), PNPM MP (Worldbank and contributing donors) | | |

| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 172,000 | 69,544 | 95,490 | people |
| Cooking/thermal energy for households | 0 | 0 | 0 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 900 | 695 | 983 | institutions |
| Energy for productive use / income generation | 1,000 | 869 | 1,336 | SMEs |

## Project strategy and key components

EnDev Indonesia (ID) focusses on mini-grid installations based on micro hydro power and solar photovoltaic technologies. Installations are community-operated and administered. Project activities are clustered into a) MHP support, b) solar PV support, c) support of productive use of energy (PU), d) capacity development, e) sustainability monitoring, and f) knowledge management.

EnDev ID has continued its strategy of expanding its technology scope and extending its cooperation and support to different public and private organisations. The objective of the former is to remain technology-independent and, instead, to focus on sustained electricity service delivery, which requires more effort than mere high quality technical implementation. The objective of the latter is to address the lack of coordination and data exchange between the various government agencies in Indonesia involved in rural electrification. In accordance with EnDev guidelines, EnDev ID seeks to identify opportunities to leverage funding from national sources.

Through this strategy, EnDev ID has to date supported 185 MHPs and 112 solar PV mini-grids, of which 69 new MHP and PV sites during this reporting period.

Towards the end of this reporting period, EnDev ID consolidated lessons learnt and conducted extensive stakeholder sensitisation and preparation for technical support to mini-grids scheduled for 2014. Greater emphasis was added on sectoral development in order to increase technical quality, improve community skills, capture more reliable baseline data, coordinate rural development initiatives across different Indonesian agencies and refine methods for remote monitoring system performance.

## Project progress (overall progress towards outcome target EnDev 2)

EnDev Indonesia was scaled up in the Annual Planning 2014. By this reporting period, it has achieved its targeted indicators as follows: 53% of people, 109% of SI, and 134% of PU.

EnDev ID's main counterpart remains **DGNREEC** and the relationship was further solidified. After the inspection of 112 DGNREEC PV mini grid sites in mid-2013, EnDev ID was requested to provide a detailed technical findings report with recommendations, present the findings both in closed-door discussions with DGNREEC officials, as well as to Indonesian solar contractors at a DGNREEC-hosted event, prepare a training programme for DGNREEC inspectors (early 2014) and conduct the same initiative at over 130 PV and MHP sites in early 2014. Furthermore, EnDev ID compiled detailed guidelines on the inspection of PV mini grids, available in the public domain.

EnDev ID established a formal cooperation with the Ministry of Cooperatives (**KUKM**) through a MoU signed in November 2013, to provide the same DGNREEC-type support to this ministry as well, along with productive use of energy (PU) training at 10 MHP sites. Using the EnDev ID methodology is the first step towards consolidated technical standards, community skills development, data collection, remote monitoring and coordination across different Indonesian ministries. Discussions with further ministries were initiated.

EnDev ID conducted key performance indicator (**KPI**) surveys at 231 rural sites from September 2012 until the time of reporting. A comprehensive re-design of the EnDev ID database was launched early 2013 under the title Database for Renewable Energy Indonesia (**DREID**). This system contains data on 358 sites (growing to 500 in 2014) and represents the most current and comprehensive source of technical, social, economic and environmental data on off-grid mini-grid sites available in Indonesia. Core data for decision makers will be presented in an interactive digital Renewable Energy Map (**RE-Map**), available both offline and online. Through the SMS-gateway (**BReIDGE**), a total of 495 short messages for daily support were processed. End of 2013, EnDev ID initiated a collaboration with the University Gajah Mada Centre of Energy (**UGM-PSE**) for managing and operating BReIDGE as an integral part of the University's energy and community programme. During this reporting period, EnDev ID was awarded the ASEAN Energy Award 2013.

## Sustainability and handover strategy

**KPI - monitoring and evaluation systems**: The KPI survey methodology is now a well-established approach, complemented by an extensive and growing database. **BReIDGE - SMS-gateway**: Streamlining and strengthening SMS-based communication between rural beneficiaries and a centralised "mentor" to offer technical and administrative guidance is a priority for 2014. The system is now ready to be operated by UGM-PSE. **DREID and RE-Map - knowledge management**: Print, audio/video and digital formats are used extensively in an effort to compile valuable experiences and lessons learnt. **DGNREEC, KUKM, KPDT and KKP – partner demand-driven**: EnDev ID has expanded its stakeholder collaboration towards a more inclusive, demand-driven approach, i.e. responding to and supporting public and private organisations that pursue rural off-grid electrification. This strengthens the sector as a whole, allows for much needed coordination, diversifies stakeholder collaborations and ensures greater degree of ownership.

## Further information

- http://endev-indonesia.or.id,
- https://energypedia.info/wiki/Category:Indonesia
- http://www.youtube.com/user/GREENergyIndonesia/videos

# Kenya

| | | | |
|---|---|---|---|
| **Promoted technology** | solar / stoves | | |
| **Project budget** | EUR 7,800,000 | **Spent until reporting date** | EUR 5,872,487 |
| **Project period** | 07.2009 – 12.2015 | **Reporting period** | 12.2013 |

| | |
|---|---|
| **Lead political partner** | Ministry of Energy and Petroleum |
| **Implementing organisation** | GIZ in cooperation with SNV |
| **Implementing partner** | Ministry of Agriculture, Aphia Plus (US funded), Kenya Tea Development Authority, German Agro Action |
| **Coordination with other programmes** | GIZ projects Adaptation to Climate Change, Water Sector Reform, Health Sector Reform, Promotion of Private Sector Development in Agriculture, PPP response to Climate Change in Tea Sector |

| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 40,000 | 35,305 | 30,592[20] | people |
| Cooking/thermal energy for households | 3,900,000 | 3,415,648 | 3,563,543 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 750 | 0 | 576 | institutions |
| Energy for productive use / income generation | 750 | 0 | 457 | SMEs |

## Project strategy and key components

Energising Development Kenya (EnDev Kenya) continues playing a key role in strengthening access to clean energy through the dissemination of clean cookstoves and small solar devices in a commercial approach, mainly through the private sector. Focus has been on strengthening partnerships and collaboration with various partners to increase stove and solar products uptake, while supporting last mile entrepreneurs (LMEs) in the value chain to grow and allow business to continue.

The stove component commenced in 2006 and continues to support access to modern cooking energy by promoting sustainable production, marketing, installation and use of two types of improved cookstoves (ICS), the Jiko Kisasa and the Rocket stove, at household and institutional level. Beyond that, energy saving baking ovens are promoted as well. Main activities include: scaling up production / construction and use of ICS and ovens (a) for households (HH); (b) for social institutions (SI); (c) for productive use of energy (PU); and (d) awareness creation about the stove and proper use of stoves and ovens at consumer and institutional level. EnDev is implemented in three counties of Kenya: Transmara, Central and Western. Overall, a good coverage rate was achieved in the clusters. EnDev Kenya has therefore decided to move out from the sub-counties with the highest coverage rate. These are Kisii, Nyamira, Vihiga, Kiambu and Muranga. The Improved Stove Association Kenya (ISAK) is requested to further report figures from these sub-counties. Meanwhile EnDev Kenya will explore new markets, hence providing an opportunity of reaching more people without ICS. Furthermore, EnDev Kenya will continue to support and play a key role in the

[20] Due to a change in picoPV counting (see chapter C.2) figures of the previous reporting period are not directly comparable to current outcome figures.

on-going Global Alliance for Clean Cookstoves (GACC) initiatives in Kenya, namely the Clean Cookstoves Association of Kenya (CCAK).

The solar component of EnDev Kenya is implemented in collaboration with SNV. It commenced in mid-2012 and continues to support access to modern lighting and basic electricity services, particularly in rural areas, through promotion of high-quality, affordable and efficient picoPV systems through a commercial approach. In order to achieve this, the programme is strategising to: (a) increase products variety and the product sales structure (i.e. identifying and building the capacity of new LMEs, establishing local distributors, increasing the variety of solar products, targeting institutions); (b) promote local technical and after-sales support services (training local technicians, establishing battery recycling mechanisms); (c) mitigate financing challenges at entrepreneur and end user level (capacity building and awareness creation in and about financing institutions); and (d) enhancing business to business linkages and new partnerships.

## Project progress (overall progress towards outcome target EnDev 2)

**Stove component**: At household level, EnDev Kenya reached a cumulative of 3,563,543 people with a total of 894,854 stoves. EnDev Kenya focusses on stove construction with more durable materials (fired bricks, insert) to increase the stove's lifespan, which in turn increases the unit cost per stove, hence slowing the rate of stoves uptake. There was a notable slow uptake of stoves by social institutions in this reporting period. 196 social institutions, mainly day schools and boarding schools, have installed 280 energy-saving stoves. The complex tendering processes and the upfront payment required by public institutions are challenging, as they easily exclude small stove dealers that do not have the capacity to participate. To solve this, EnDev Kenya is working closely with the Ministry of Energy and Petroleum (MoE&P) to revise tendering requirements for institutional stoves at public institutions and change existing policies. The Energy Regulatory Commission is drafting new regulations to make it mandatory for institutions to install energy-saving stoves.

Between July and December 2013, about 108 enterprises have installed 160 energy-saving stoves or baking ovens for productive use. To increase the uptake of stoves and ovens for productive use especially in hotels, EnDev Kenya is collaborating with the Public Health Department of the Ministry of Health to make the use of clean cooking devices a condition for licencing of businesses.

**Solar component:** In total, EnDev Kenya reached 75,075 people with small solar systems. This translates to over-achievement of overall targets. A total of 15,022 products were sold by entrepreneurs since the PicoPV component started (mid-2012). A total of 150 last mile entrepreneurs are active on the solar market, with each one of them consistently retailing an average of 20 products per month. Key challenges noted in 2013 are missing local awareness, inadequate local distribution channels, limited after sales service / technical support at local levels, absence of recycling mechanisms and financing challenges for both solar entrepreneurs and end users. In this regard, EnDev Kenya will focus on establishing local distribution networks, training and capacity building of local technicians, facilitating linkages with financial institutions and e-waste recycling companies as well as awareness creation / capacity building of financing institutions on solar technology.

## Sustainability and handover strategy

**Stoves component:** The sustainability study completed in Feb 2013 showed an overall penetration rate of 71% in the focal areas with an overall stove usage rate of 89%. This was a significant achievement and an indication of technology acceptance and affordability. The

study also showed an overall maintenance rate of 48% and replacement rate of 44%, which raises questions on how the users value their stoves and keep them in good condition. EnDev Kenya is sensitised regarding sustainability, focussing on activities and measure, which are supposed to enhance long-term sustainability: e.g. further support and cooperation with the stove associations ISAK and CCAK, collaboration with the Kenya Industrial Research and Development Institute (KIRDI), development of a curriculum on stove construction for vocational training centres, capacity building for end users as well as for entrepreneurs in business skills and marketing.

**Solar Component:** EnDev Kenya builds the capacity of different actors and facilitates sustainable business-to-business linkages, therefore leaving the entire commercial activities to the private sector: importers, national distributors, local distributors and the last mile entrepreneurs. EnDev Kenya is not part of the supply chain of solar products; hence, this will ensure that solar entrepreneurship continues long after the programme closure. EnDev Kenya will train local technicians to provide after-sales support and repairs services for solar products closer to the end users, while also involving them in recycling used batteries and electronic waste. These measures will address the issues raised in the picoPV sustainability study, which provided recommendations on improving awareness creation, creating local service centres and developing mechanisms of battery recycling.

**Political level:** EnDev Kenya is also collaborating with the Ministry of Energy and Petroleum (MoE&P) to build the capacity of some 16 Energy Centres across the country for better provision of technical support, capacity building and awareness creation on solar and improved cookstoves technologies.

## Further information

PicoPV sustainability study focusing on SNV regions, December 2013.

# Liberia

| | | | |
|---|---|---|---|
| **Promoted technology** | solar / stoves | | |
| **Project budget** | EUR 990,000[21] | **Spent until reporting date** | EUR 230,378 |
| **Project period** | 05.2012 – 03.2015 | **Reporting period** | 12.2013 |
| **Lead political partner** | Ministry of Lands, Mines and Energy | | |
| **Implementing organisation** | GIZ | | |
| **Implementing partner** | Rural Renewable Energy Agency, GIZ Development Oriented Emergency and Transitional Aid (DETA) in Lofa, Agro Action (Welthungerhilfe), Lighting Africa | | |
| **Coordination with other programmes** | GIZ program "Development Oriented Emergency and Transitional Aid (DETA); SOS Children's Village Liberia; GIZ Renewable Energy Project Development Programme (PDP); Emergency Power Program (EPP) funded by USAID, Norway, the European Commission, and the World Bank; Liberia Electricity Enhancement Project (LESEP) funded by the World Bank; Gaps Project funded by Norway and others still to be identified. | | |

| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 5,500 | 2,243 | 657[22] | people |
| Cooking/thermal energy for households | 5,500 | 1,524 | 4,259 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 10 | 0 | 0 | institutions |
| Energy for productive use / income generation | 150 | 150 | 155 | SMEs |

## Project strategy and key components

The implementation of the EnDev activities in Liberia started in May 2012 and focuses on five components:

**Electricity for households**: EnDev supports the development of a market for picoPV products based on local sales agents. Partners are the solar retailers participating in the Lighting Africa programme, the GIZ "Development Oriented Emergency and Transitional Aid" (DETA) programme with its local partner organisations such as "Foundation for Women (FfW)", SOS Children's Villages Worldwide and possibly also Agro Action (Welthungerhilfe). EnDev is providing a limited number of lanterns as start capital for partner organisations. In addition, EnDev provides training to entrepreneurs and local organisations.

**Clean cooking technologies**: EnDev supports the import of improved charcoal stoves that are successfully disseminated in other African countries. In parallel, local craftsmen are trained to produce stoves locally. The stoves are commercialised by local retailers. Marketing campaigns are carried out to create awareness among the households about advantages of modern stoves.

[21] Including an additional variable up-scaling of up to EUR 240,000, depending on achievements of milestones.

[22] Due to a change in picoPV counting (see chapter C.2) figures of the previous reporting period are not directly comparable to current outcome figures.

**Mini-grids**: EnDev supports the installation of one pilot mini-grid up to a size of 100 kW, also including management and technical training aspects.

**Energy for social Institutions**: SHS for schools and other social institutions will be installed preferably in combination with battery charging stations or solar kiosks that offer charging services to the community.

**Energy for SMEs**: EnDev supports the dissemination of solar dryers for agricultural products such as primarily cocoa beans for SMEs in close cooperation with GIZ DETA.

## Project progress (overall progress towards outcome target EnDev 2)

Since the last reporting period the number of persons who purchased solar lanterns with the support of EnDev almost doubled. However, due to a recent adaptation of the EnDev picoPV counting methodology (see chapter C.2) this figure reduced to only 657 persons, accountable for EnDev. EnDev tries to develop entrepreneurial and technical skills among solar lantern retailers and technicians. In this context two technical solar training courses were conducted for all together 70 participants (stakeholders, taking part in a World Bank financed project, as well as technicians working for different private companies and members of two polytechnic schools). This activity contributes to set up a maintenance structure for the picoPV sector in Liberia and may potentially also increase the sustainability of the ongoing World Bank program.

In the ICS sector, the product development continues. The technical layout of the Liberian prototype stove developed under EnDev was again improved. The results of a water boiling test show that the previous “Red Fire Pot” (RFP) reduces the specific fuel consumption by 69% and the new RFP by 75% compared to the average performance of the baseline stove. Research to prevent the fast corrosion process also goes on – though it seems that options for improvement are limited due to extreme marine climate conditions. A ToT for local stove producers was conducted, and the process of stove testing in households continues – in cooperation with SOS Children’s Village locations in Liberia. In parallel, EnDev still cooperates with a local retail company that imports and sells stoves from India. In total EnDev has so far supported 4,259 persons in gaining access to clean cooking in Liberia (increased by 2,735 persons during the current reporting period).

About one third of the solar cocoa bean dryers installed in 150 farmer groups of a large agricultural cooperative in Foya district have been visited for monitoring purposes. Major findings revealed that most dryers have been used properly. However, the level of proper usage and quality differs from one sub-cooperative to another. Since using these dryers is still new for most of the farmers, awareness raising and systematic maintenance activities need to be undertaken, along with regular monitoring visits.

## Sustainability and handover strategy

The sustainability of the project activities shall be attained by working through and supporting existing structures and by implementing awareness raising and capacity building activities – both in technical as well as in project management skills.

## Further information

As an incentive for commitment towards implementation of the project activities, the overall budget increases by an additional variable budget of up to EUR 240,000, depending on the achievement of predefined milestones. Even though slightly delayed, the first two milestones have been achieved for ICS, as well as the first milestone for household electrification (see chapter C.2). Therefore, a budget increase by EUR 180,000 can be approved.

# Madagascar

| | | | |
|---|---|---|---|
| **Promoted technology** | stoves | | |
| **Project budget** | EUR 300,000 | **Spent until reporting date** | EUR 240,246 |
| **Project period** | 12.2012 – 03.2014[23] | **Reporting period** | 12.2013 |
| **Lead political partner** | In the absence of a functioning government structure, the project works mainly with local leaders and community structures | | |
| **Implementing organisation** | Association pour le Développement de l'Energie Solaire (ADES) in cooperation with GIZ Madagascar | | |
| **Implementing partner** | Local retailers | | |
| **Coordination with other programmes** | Action Sud Développement Durable Genève (ASDDG), Madagascar National Parks (MNP), Vozama, WWF Madagascar, GIZ Programme Protection and Sustainable Use of Natural Resources | | |

| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 0 | 0 | 0 | people |
| Cooking/thermal energy for households | 47,500 | 0 | 2,430 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 0 | 0 | 7 | institutions |
| Energy for productive use / income generation | 0 | 0 | 9 | SMEs |

## Project strategy and key components

The overall project strategy is to develop an expanded local production capacity for improved cookstoves (ICS), and to ensure a sustainable market for ICS in urban and peri-urban areas in Madagascar. Concretely, the productivity and number of assembly lines for a factory of the so-called OLI-stoves will be increased. The different types of OLI stoves are built for wood and charcoal combustion. A second key activity is the establishment of outlets and sustainable marketing structures in new areas of Madagascar, namely the capital Antananarivo. This component includes an awareness campaign for the OLI stoves.

The Swiss NGO Association pour le Développement de l'Energie Solaire (ADES) has been active in Madagascar for many years. ADES contributes to EnDev Madagascar with own financial resources, including carbon financing. The private sector does not invest due to the political instability in Madagascar. There are only very few organisations producing ICS at present. Massive deforestation and droughts in the past decades have led to a situation in which the prices of firewood and charcoal, as well as the stress on the biodiversity have enormously increased. Against the background of increasing prices for cooking energy, the demand for efficient cooking stoves continuously increases.

## Project progress (overall progress towards outcome target EnDev 2)

**1. Production centre in Fianarantsoa:** The construction of the new production site was finished by November 2013. At the same location as the production site, a new sales centre

[23] Since the implementing organisation requested a cost-neutral prolongation of the project only in February 2014, a cost neutral extension of the project period until March 2015 will be requested in the Updated Annual Planning 2014 document.

was constructed directly along the main road. After the inauguration of the new centre in Fianarantsoa on the 16th of November 2013, the production of clay cores for the energy-efficient stoves started. For the production, another ten workers were employed by the end of December. The number of employees in the new production site is still increasing in the course of reaching full production capacity. In December, an international expert was hired to organise the production process in order to increase the production and still guarantee the quality of the products. The first ICS manufactured at the new site are to be expected in January 2014.

**2. Bucket production in Tuléar:** The metal workshop in Tuléar is now completely installed. The machines ordered in Europe arrived with two months delay in November. In December, the expert for bucket production came to Tuléar a second time to install all the new machines and to organise the large-scale bucket production. By the end of the month, 300 buckets were produced. To achieve the goal of producing 20,000 buckets in 2014, further local staff will be recruited at the beginning of 2014.

**3. Sales centre in Antananarivo:** The sales centre in Antananarivo is already open since the 1st of June 2013. Until the end of 2013, this centre sold 3,301 ICS, some of which were sold to schools and restaurants. Since the new centre in Fianarantsoa has only started production in November, their products are expected to be sold in Antananarivo in February 2014. Therefore, all products sold in the capital city have been produced in the already existing production centre.

All infrastructure adaptations on all three parts of the project are completed. Mainly due to an increasing production in Fianarantsoa, the production for ICS is expected to continually increase from 15,000 in 2013 to a total capacity of 25,000 ICS in 2014. 6,000 of those are planned to be sold in Antananarivo and 3,000 in Fianarantsoa.

The Bucket production in Tuléar turns out to be a big challenge. Since the team in the metal workshop has to be trained to perform completely new tasks, this part of the project requires time to achieve its intended capacity. To prevent the risk of not having enough buckets for the production of ICS in 2014, a last delivery of 10,000 conventional buckets will arrive in February 2014. Nevertheless, the workshop is well-organised now and will be able to achieve its goals.

## Sustainability and handover strategy

Resellers will be employed for the final distribution of the ICS in and around Fianarantsoa. Nevertheless, the bulk of the production will be transported to Antananarivo, where the largest demand for energy efficient stoves can be seen due to high prices for fuelwood and charcoal. Producing the buckets locally in Madagascar instead of importing them from Europe has the positive effect of decreasing overall costs, while the employment level in the economically disadvantaged area of Tuléar increases.

So far, ADES Madagascar employed 138 local people. With its annual production of 15,000 ICS in 2013, ADES is the largest producer of ICS in Madagascar. Besides ADES, significant support to the local ICS sector is provided by the bilateral programme with Germany, implemented by the GIZ. As the two programmes cover different price segments cooperation makes sense, namely in the cities of Tuléar and Mahajanga where both organisations are present. Discussions are underway to develop such synergies.

## Further information

The political situation in the final months of 2013 was very unstable. With both presidential candidates achieving around 50% in the last vote, political stability has not returned yet.

# Malawi

| | | | |
|---|---|---|---|
| **Promoted technology** | stoves | | |
| **Project budget** | EUR 500,000 | **Spent until reporting date** | EUR 225,482 |
| **Project period** | 12.2012 – 12.2014 | **Reporting period** | 12.2013 |

| | |
|---|---|
| **Lead political partner** | Ministry of Energy |
| **Implementing organisation** | The local non-profit organisation "MAEVE" in cooperation with GIZ |
| **Implementing partner** | Stove producers, private sector, PR and marketing specialist |
| **Coordination with other programmes** | National Improved Cookstove Task Force (Irish Aid funded), Presidential Initiative '2 million stoves for Malawi by 2020', DISCOVER programme (UK aid, Irish Aid and Norway funded), IRTICP (Irish Aid funded), COOPI (EU funded), Mbaula Network |

| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 0 | 0 | 0 | people |
| Cooking/thermal energy for households | 125,000 | 9,217 | 27,471 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 0 | 0 | 0 | institutions |
| Energy for productive use / income generation | 0 | 0 | 0 | SMEs |

## Project strategy and key components

The overall project strategy is to enhance a financially sustainable market for improved cookstoves in urban and peri-urban areas of Malawi by strengthening both the supply and the demand side. EnDev Malawi, through its implementation partner MAEVE, follows the concept of separating production from marketing throughout its work. On the demand side, activities focus on creating demand and consumer interest in the ceramic firewood stove “Chitetezo Mbaula (CB)”, the sole technology promoted under EnDev. On the supply side, EnDev Malawi enhances the capacities of craftsmen producing the energy efficient cookstove “Chitetezo Mbaula”. The project links production and demand by acting as an interface between predominantly rural, informal, small scale producers and urban, formal sales outlet chains and organising transportation of stoves to urban areas. Thus, EnDev facilitates the creation of a sustainable distribution system for fuel-saving firewood stoves in the major urban and peri-urban areas of Malawi.

## Project progress (overall progress towards outcome target EnDev 2)

7,854 stoves were sold between July and December 2013, to push the total stoves sold by the end of December 2013 to 11,891. This figure is behind the envisaged target, mainly due to supply constraints in the months leading up to Christmas. Demand was successfully created by many avenues of promotional activities, with orders increasing from 1,000 stoves per month to 4,000. This was two times the available supply, preventing the project to reach the desired targets. Measures to increase supply are expected to bear fruits in 2014 so that overall targets seem achievable. Promotions like billboard advertising, radio adverts and professional road shows created brand awareness of the CB, especially in the major centres Lilongwe and Blantyre. The road shows were most successful with an enticing stage play and interactions with the audience, who could receive prizes for correct answers regarding

the stove and its benefits. Large billboards and branded trucks showing the CB brand ambassador Hazel Warren cooking on the CB stove assisted to create the ideal image of the stove being used by a modern urban woman.

Selected Puma filling stations and Chipiku supermarkets nationwide have become major retail outlets, submitting numerous stove orders. Following the road shows and radio adverts, stove sales and the number of outlets wanting to retail the stove increased exponentially. MAEVE therefore increased its transport capacity and purchased a second truck with higher loading capacity. Call centre agents received many orders and MAEVE generated over 3,000 corporate Christmas orders, which will be completed in the course of January 2014 once supply is ready. Ensuring a constant supply of up to 4,000 quality stoves per month was the biggest challenge in 2013. Agreements have been reached with major producers and NGOs to source larger quantities of quality stoves from their production groups. More groups were trained specifically in strategic regions to boost the supply. These efforts will continue in 2014. It is envisaged that after the harvest in April supply will increase by factor four or more.

## Sustainability and handover strategy

The biggest lesson during the last reporting period was that supply has to be able to meet customer demand. In contrast to previous years, where supply was always high while there was little demand, the desire to produce more was quite low. In 2013, the exponential increase in demand due to successful marketing has started to boost supply by groups that were once dormant or producing only upon request by a few customers.

The increased demand initially resulted in poor quality stoves produced in a hurry, requiring the monitoring team to emphasise and advise on quality assurance of stoves. The overall concept of separating production from marketing has proved a successful model: increased sales and the eagerness of consumers to purchase the CB have motivated artisans to step up stove production. Yet, it took some time for the production to respond to the created demand, so there was a time-lag during which the supply would not suffice to fulfil orders. Many groups which were once producing for a small number of customers or were dormant are now increasing or commencing production. As such, several groups which were regarding stove production as a seasonal secondary source of income previously, have now moved towards making production of stoves their primary source of continuous income throughout the year. Many rural stove producers started outsourcing their former primary jobs to other people, leading to increased employment opportunities in the rural areas.

As handover strategy, it is envisaged to create sufficient demand for a sustained supply beyond the project period. Key elements will be a continued portrayal of the CB as the appropriate alternative to three stone fires and even charcoal stoves, coupled with a constant supply of good quality stoves to the markets. The supply chain can be supported through a warehouse system and a good distribution network. Carbon offsetting from stoves sold in 2013 and 2014 shall commence in 2015 and will be a key element to support sustainability of the supply and demand system created by then.

## Further information

The urban pricing of the stoves still stands at MWK 800 (EUR 1.86) at wholesale and MWK 1,000 (EUR 2.33) at retail level. The end-user prices of the stoves promoted under the EnDev project are in no way subsidised by EnDev or by any other party (Government, donor, charity, carbon finance). No price changes have been observed in rural areas with the purchase price at the production site remaining at MWK 500 (EUR 1.17), and retail prices at rural markets starting at MWK 600 (EUR 1.40).

# Mali

| | | | |
|---|---|---|---|
| **Promoted technology** | solar | | |
| **Project budget** | EUR 5,000,000 | **Spent until reporting date** | EUR 2,504,735 |
| **Project period** | 04.2009 – 12.2017 | **Reporting period** | 12.2013 |
| **Lead political partner** | Ministere de l'Administration Territoriale et des Collectives Locales (MATCL) | | |
| **Implementing organisation** | GIZ | | |
| **Implementing partner** | Direction Nationale de Collectivites Territoriales (DNCT) ; Agence Malienne pour le Developpement de l'Energie Domestique et de l´Electrification Rurale (AMADER) | | |
| **Coordination with other programmes** | Programme Promotion of Local Government (PACT) | | |

| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 100,000 | 16,211 | 14,284[24] | people |
| Cooking/thermal energy for households | 0 | 0 | 0 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 180 | 112 | 112 | institutions |
| Energy for productive use / income generation | 50 | 0 | 0 | SMEs |

## Project strategy and key components

Under the acronym ELCOM (ELectrification COMmunale), EnDev in Mali originally aimed to facilitate access to electricity of rural households through PV-driven Battery Charging Stations (BCSs) and to rural Social Institutions (SI) through solar home systems (SHS). Thereby BCSs remain communal property and are operated on a fee-for-service basis by private service providers who are also responsible for O&M of SHSs in SI.

A fixed percentage of the revenues from BCSs should be deposited into a fund to cover costs for repair and replacement of hardware, both at BCSs and in SI. Declining BCS frequentation necessitated revision of this (business) model with communities eventually taking (financial) responsibility for repair and maintenance of installations at SI.

As a separate activity of the current ELCOM phase also the installation of a solar-diesel hybrid mini-grid was foreseen, as a pilot for an eventual next phase.

In 2013 two activities were added: the facilitation of the distribution of picoPV through BCSs and the setup of a hire-purchase scheme for solar-batteries and in-house installations.

In its third phase – starting 2014, proposal is accepted – ELCOMs strategy will shift towards more broadly supporting the distribution of picoPV in rural areas and the set-up of PV diesel hybrid mini grids in larger villages. Existing BCSs will be converted into multi service energy kiosks over time.

[24] Due to a change in picoPV counting (see chapter C.2) figures of the previous reporting period are not directly comparable to current outcome figures.

## Project progress (overall progress towards outcome target EnDev 2)

Pending the outcome of the crisis that started in Mali in March 2012, ELCOM was effectively hibernating since then. The July 2013 elections eventually instilled the confidence that the project should be revived and continued. As ELCOM's second phase was anyway coming to an end, an up-scaling proposal, including new activities was submitted to, and accepted by the governing board in November 2013. The activity level during the last semester subsequently was only limited:

Analysis of data-logger readings revealed various cases of serious underreporting; these cases were addressed to the respective steering committees, which in six cases (out of 17 BCSs surveyed) led to stringent measures, a.o. replacement of the technicians concerned. Dataloggers were installed in all (33) BCSs that so far were not monitored. Apart from the underreporting issue and despite stimulating measures, BCS frequentation is steadily declining. Dropping from 9,500 70Ah battery equivalents in 2011 to 7,500 in 2012 (then believed to be crisis-related), the number dropped this year again further down to just 5,300, being even 15% lower in the second semester than in the first. By now it's clear that this is caused by more and more people buying their own PV panel because they can afford it now. This effect undermines the intervention's business model permanently. Thus, workshops with communities were held to address this issue, resulting in communities taking over (financial) responsibility for repair and maintenance of hardware at SI, to which end an electrification component will be added to school- and hospital-fees.

BCS frequentation ranged from 0-49% of the maximum capacity, with an average of 11% for ELCOM 1 communities (previous semester: 17%), and 21% for ELCOM 2 communities (26%). With SI financially uncoupled, this frequentation now mainly shows the need to find other use for the excess electricity; it's no longer an indicator for (lack of) sustainability of the operation.

While the decline in BCS frequentation generally relates to an increase in the number of individual systems, in the already poor, remote, community of Bellen the decline is caused by continued unrest resulting in an even further impoverishment. People there simply can't afford (charging) a battery anymore, let alone buying a panel.

Further to the low BCS frequentation, initial consultations were held with the communities concerned in order to decide what to do with the BCSs in future, where the general suggestion is to convert those into energy kiosks, offering services like cooling.

Distribution of picoPV through BCSs in collaboration with Foundation NOTS continued. After an initial peak, sales settled at a lower level with large differences between operators. Some of them also started selling lamps through other outlets, on weekly markets etc. This semester some 700 lamps were sold, 200 of which outside the BCSs.

In preparation of ELCOM's third phase, based on existing GIZ presence and structures, an additional 19 communities for future picoPV distribution were identified.

A business model for the planned mini-grid was developed and discussion with AMADER on a tariff setting is ongoing. This is not an easy discussion as (sufficiently) high tariffs are crucial for sustainable operation yet undesirable from a social perspective.

## Sustainability and handover strategy

New insights on the declining BCS frequentation led to a lowering of the sustainability factor thereof. With responsibilities shifted, electrification of SI seems reasonably ensured. The sustainability of picoPV activities looks promising.

# Mozambique

| | | | |
|---|---|---|---|
| **Promoted technology** | solar / stoves / hydro / grid | | |
| **Project budget** | EUR 10,800,000 | **Spent until reporting date** | EUR 5,826,857 |
| **Project period** | 10.2009 – 12.2015 | **Reporting period** | 12.2013 |
| **Lead political partner** | Ministry of Energy | | |
| **Implementing organisation** | GIZ in cooperation with SNV | | |
| **Implementing partner** | Electricidade de Moçambique (EdM), Fundo de Energia (FUNAE), Direcções Provinciais de Energia (DIPREME), MFIs, NGOs, universities, colleges and private enterprises | | |
| **Coordination with other programmes** | BMZ: Decentralisation Programme (PPFD), Education Programme (PEB), Economic Development Programme; BTC (Belgian Technical Cooperation): Rural Energy for Rural Development | | |

| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 71,000 | 78,844 | 69,385[25] | people |
| Cooking/thermal energy for households | 250,000 | 0 | 4,035 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 26 | 11 | 12 | institutions |
| Energy for productive use / income generation | 203 | 85 | 88 | SMEs |

## Project strategy and key components

EnDev Mozambique, also known as Access to Modern Energy Services Mozambique (AMES-M), is involved in grid densification, pico and micro hydro power plants, improved cooking and (small) PV systems. Through a bottom-up approach, the project aims at creating functional structures that can be used as a leverage to influence government policies.

**Grid:** EnDev Mozambique will continue grid densification in peri-urban areas in cooperation with the local utility EdM.

**Hydropower**: In the field of micro hydro power, EnDev is working on implementing a commercial operator model in which the operator obtains financing for the hydropower plant and related productive use installations. EnDev aims at capacitating local contractors with the ability to design, install and maintain the hydro installations. Local educational institutes are involved to build up a sustainable knowledge base.

**Solar:** The project interventions in the picoPV and SHS components aim at working with private sector partners. Importers, wholesalers and retailers of PV products receive training on technical and quality aspects as well as training on sales, marketing and customer service. Awareness campaigns as well as the establishment of training, testing and research centres complement these activities.

**Stoves:** The biomass energy component of EnDev Mozambique uses the new Biomass Energy Strategy (BEST) as reference and guide to coordinate its activities with other

[25] Due to a change in picoPV counting (see chapter C.2) figures of the previous reporting period are not directly comparable to current outcome figures.

organisations. EnDev Mozambique supports marketing, awareness raising and the introduction of high quality stoves that comply with international and EnDev requirements.

## Project progress (overall progress towards outcome target EnDev 2)

**Grid:** By the end of 2013, EdM showed renewed interest to continue the grid densification efforts started under EnDev 1 and 2 in suburban areas in the Manica province. Negotiations on project proposals received by EnDev are still ongoing, with the aim to achieve a more favourable cost-efficiency level; the follow up is now foreseen in early 2014. Options to scale up the grid densification approach using KfW development loans did so far not materialise. A new initiative with EdM Chimoio is being developed.

**Hydropower:** A thorough review of all hydro activities by external consultants revealed significant shortcomings in the technical, administrative and monitoring processes of the local NGO Associação Kuaedza Simucai Manica (AKSM). AMES-M therefore decided not to continue this cooperation. A physical spot check of each and every connection has been carried out. There are currently 15 hydro sites (including EnDev 1 activities) finalised with a total installed capacity of 300 kW. Four need urgent technical repairs and upgrading and offers for rehabilitation work are being studied. The average tariffs charged range from 200 to 500 MZN per month (EUR 4.50 to 12), depending on the site and specific use (private/business).

A commercial bank is interested in financing pico and micro hydro projects. Their conditions for a loan scheme are not acceptable yet, but negotiations continue.

The Chimoio Excellence Centre Hydro Department (ECHD) will try to obtain a legal status in 2014. At the request of the universities involved, the focus of the “centre”, which is still in a virtual stage, will be shifted to renewable energy technologies in general. New ToR are being drafted.

A survey investigating the productive use potential at MHP sites was carried out. It included options for irrigation with ram pumps and battery charging stations. The results of the pilots with ram pumps and a battery charging shop will determine further involvement and potential financing by the national energy fund (FUNAE). Students of the universities and colleges in Chimoio are actively involved in the process.

**Solar:** The solar training centre at the Instituto Industrial de Maputo (IIM) is operational. A management model was developed and since the inauguration, several (paid) trainings have been carried out at the centre. AMES-M developed new training material for the technical and the commercial sales training, which is compatible with national requirements for formal vocational training.

The test laboratory at the Eduardo Mondlane University (UEM) took shape. The solar testing facility will be a nucleus of a research centre for renewable energy next to the test facility for improved cooking technology. A Memorandum of Understanding for cooperation with AMES-M was signed and the university allocated an amount of nine million MZN (EUR 210,000) to develop the centre. An expert advisor was appointed to guide the process and will start working in the course of 2014.

More than 14 enterprises and 61 PV sales outlets currently cooperate with AMES-M. More than 335 staff members of the sales outlets and potential PV entrepreneurs have been trained in 43 sessions since the start in 2012. The firms have experienced steady sales figures in the past monitoring period. AMES-M is preparing a cooperation agreement with partner companies to support the establishment of sales outlets in rural areas.

**Stoves:** SNV has signed a grant agreement with AMES-M in June to promote 40,000 stoves in and around Maputo. Two of the selected stoves will be produced on a semi-industrial scale, with expected output of several thousand per month. FUNAE is being assisted in the establishment of a production unit for a stainless steel improved cookstove developed by Rocket Works in South Africa. Negotiations are underway for the dissemination of up to 30,000 locally-assembled, high-quality stainless steel stoves. To introduce the new technology to the market, it is foreseen that victims of previous flooding disasters will be supplied with the stainless steel stoves at partly or completely subsidised conditions in cooperation with the BMZ-financed disaster management programme. Apart from the flood victim project, AMES-M aims to financially support the production and distribution chains, rather than directly subsidising product prices. Negotiations with the Italian NGO Associazione Volontari per il Servizio Internazionale (AVSI) to commercially disseminate some 7,500 Envirofit CH-2200 charcoal stoves in a slum area are in its final stage.

With support from the global EnDev management, a new system, hardware and software for online monitoring and evaluation purposes, has been developed. The system developed originally by EnDev Peru is suitable for all technologies and is increasingly used by other EnDev projects. SNV Mozambique contributed 50% to the introduction and adaptation of the system to the Mozambican context. A UEM spin-off foundation developing carbon projects is involved in monitoring, distribution and financing issues for improved cookstoves.

By December 2013, some 776 Zavala charcoal stoves were sold in the component implemented by SNV. These stoves have been technologically improved over the past year and can now be manufactured on a semi-industrial scale and comply with EnDev efficiency requirements.

The previous ProBEC partner NGO Agência de Desenvolvimento Econômico Local (ADEL) in Sofala province claims to have sold some 35,000 improved stoves since the end of the intervention in 2011. Due to security concerns caused by violent political unrest in that region of Mozambique, an evaluation or a new baseline study following up on this EnDev 1 activity could not be implemented yet.

## Sustainability and handover strategy

The NGO-driven approach in micro and pico hydro was of limited success and thus, EnDev Mozambique abandoned the cooperation with the NGO. Now that a clear picture of the technical status of the hydro sites is available, EnDev will facilitate and finance technical improvements of the existing sites to ensure their long term operation and sustainability.

It is EnDev Mozambique's conviction that the chosen strategy of the programme has sufficient security built in for sustained development of the specific technologies in the energy sector. The cooperation with main actors such as FUNAE, the involvement of the educational infrastructure (knowledge/advisory base), local banks as well as a specifically capacitated private sector and NGOs, with experience in both community development and implementation, guarantees a sustained capacity and knowledge base in the country. The strategy of AMES-M for the coming two years aim at transferring a part of the project's role to the local renewable energy knowledge centres in Chimoio and in Maputo by 2015. These units should be operated, at least partly, on a commercial basis.

## Further information

Extended version of the country sheet is available on the EnDev Wiki.

# Nepal

| | | | |
|---|---|---|---|
| **Promoted technology** | hydro / grid | | |
| **Project budget** | EUR 4,740,000 | **Spent until reporting date** | EUR 1,460,759 |
| **Project period** | 05.2009 – 06.2015 | **Reporting period** | 12.2013 |
| **Lead political partner** | Ministry of Energy | | |
| **Implementing organisation** | GIZ | | |
| **Implementing partner** | a) Grid: Ministry of Energy / Nepal Electricity Authority (NEA), National Association of Community Electricity Users Nepal (NACEUN)<br>b) Micro Hydro Debt Fund (MHDF): Ministry of Science, Technology and Environment (MoSTE) / Alternative Energy Promotion Centre (AEPC), Integrated Watermill activity: SNV<br>c) Productive Use: NACEUN / HELVETAS Swiss intercooperation | | |
| **Coordination with other programmes** | Nepal Energy Efficiency Programme (NEEP), National Rural and Renewable Energy Programme (NORAD/DANIDA/DFID/KFW), Renewable Energy for Rural Livelihood (WB/UNDP), FMO Development Bank, HELVETAS Swiss Intercooperation, SNV | | |

| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 240,637 | 179,416 | 199,826 | people |
| Cooking/thermal energy for households | 0 | 0 | 0 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 33 | 304 | 354 | institutions |
| Energy for productive use / income generation | 289 | 551 | 1,041 | SMEs |

## Project strategy and key components

EnDev Nepal is based on three main components providing electricity to rural communities: The first component supports the National Rural Electrification Programme (NREP) implemented by the national utility (NEA) for grid extension to communities. EnDev has signed a grant agreement with the utility to partially finance the grid extension to 49 Community Rural Electrification Entities (CREE). EnDev provides organisational, technical as well as financial support to the CREEs that manage electricity distribution within the community, and provides all necessary training to employees to operate as an independent village utility.

The second component supports the efforts of remote communities to get access to electricity from micro hydropower plants via a dedicated debt fund (MHDF), enabling them to repay the high upfront costs over a long period of time, and encouraging commercial banks to finance projects in the rural energy sector. This component is administered by the Alternative Energy Promotion Centre (AEPC), associated to the MoSTE. The MHDF is aligned with the new multi donor-funded National Rural and Renewable Energy Programme (NRREP) for the energy sector of Nepal, which is in implementation since July 2012. EnDev has taken part in the preparation of this plan alongside other development partners.

In addition, a pilot activity has been started to improve traditional water mills (IWME) to create electricity, which is implemented by SNV on behalf of EnDev.

The third component supports productive use (PU) of grid electricity to enhance sustainability of the CREEs and is conducted in cooperation with Helvetas Swiss Intercooperation and the National Association of Community Electricity Users Nepal (NACEUN). Hereby, four CREEs are enabled to engage in PU promotion. The second part of the approach trains local champion entrepreneurs as Enterprise Service Providers (ESP) for start-ups.

## Project progress (overall progress towards outcome target EnDev 2)

**Grid Extension:** Since the last reporting period, 18,774 additional people, 50 social institutions and 468 rural businesses have gained access to electricity. Roughly half of these new connections have been added through four newly electrified CREEs, whereas the rest are additional connections in previously electrified CREEs. In total, the component has facilitated energy access to 189,630 people, 327 social institutions and 972 rural businesses through successful electrification of 36 out of the 49 CREEs.

During the past six months, six outcome verification visits have been conducted. As realised recently, some CREEs only took out loans for constructing part of their distribution grid. In those CREEs, earlier and later phases of grid extension were implemented that did not benefit from the financial support. However, technical assistance was provided through EnDev. In 2014 a review will be done on the EnDev attribution of outcome numbers from this component. The small leveraging financial contribution (up to 15%) will be balanced against the capacity development measures that are additionally provided.

**Hydro:** Since the last reporting period, 1636 additional people and 22 rural businesses gained access to electricity. Most of these new connections were made in two newly commissioned MHP sites, whereas also in existing sites connection numbers increased. In total, MHDF funds have been assigned to 22 MHP projects, of which 15 have been commissioned. Processes for loan approval and disbursement for new sites are still pending.

Under the piloting of Electrification through Improved Watermills (IWME) a concept was developed in four sites for integrated electrification and productive use (by keeping the milling activity while promoting an additional PU activity using electricity). The activity resulted so far in access for 84 households. Until now, about EUR 100.000 was allocated.

**PU:** Capacity building support to CREEs continued during this reporting period. "PU Teams" were formed in all four CREEs, and PU promotion strategies for the year 2014 were developed. ESPs have identified 216 potential entrepreneurs in their respective areas. These numbers include business start-ups and growing existing businesses. 62 clients attended a general orientation by ESPs and 53 entrepreneurs received business-to-business skills coaching. Around 20 local natural resources were explored, such as coffee, bamboo, orange, turmeric and different kinds of herbs. This leads to around 50 types of potential enterprises, such as dried fruit candy making, bamboo products, milk chilling, carpentry, welding, herbal processing, incense stick production and poultry farming. Basic information dissemination was conducted through pamphlets among 2,000 households.

## Sustainability and handover strategy

**Grid Extension:** With continuous lobbying efforts of CREEs and NACEUN, re-establishment of the Community Rural Electrification Department (CRED) in NEA was a major development in the second half of 2013, with firm commitment of NEA to pursue rural electrification efforts based on the CREE model. Planning and staffing of the new department is on-going. In the 13 remaining un-electrified CREEs, delays by NEA in the procurement processes remain. However, there are also promising changes as NEA is now making efforts to ensure the quality of purchased hardware after a procurement scandal of transformers last year.

Repayment of the revolving fund, which facilitated the electrification efforts, has further slowed down over the last period, currently at roughly 25%. Even though the CREEs are willing to repay in principle, transparency in the management of the fund is lacking on the side of NEA and there seem to be no consequences for non-repayment. EnDev provides support to NACEUN to advise NEA in developing a new modality to manage the fund. NEA is interested in future cooperation with EnDev and seems committed to improvement.

In some CREEs, decreased connection numbers are reported due to rural-urban migration. In other CREEs, a reduction of sub-metering connections was observed, with compensation in regular connections, suggesting that part of the sub-metering customers have managed to connect as regular customers. A significant increase in connected SMEs during the reporting period also shows a promising trend towards local development and CREE sustainability.

**Hydro:** The loan pipeline of the two involved banks had been stagnating for a few months in the reporting period, given a delay in disbursement over administrative challenges. The MHDF was agreed to continue in the current form until the initial contract amount would be disbursed early 2014, after which a new contract modality shall be explored for the remaining funds added after up-scaling. Analysis of the financial mix of projects financed through the MHDF until now is showing that the average contribution is 40%, replacing the 50% figure used until now.

The banks report that communication with clients and repayment of the loans has been difficult given the remoteness of the sites, but none of the supported sites are showing overdue payments structurally. From the bank's perspective, the financing of rural MHP seems to become a 'regular business', since one of the two involved banks already financed two additional sites outside of MHDF. A more systematic review of outcomes, attribution and impacts is foreseen in the running year.

Various donors within the national single-modality energy program "NRREP" have shown interest in the recent success and innovative approach of the MHDF as an operational example of credit financing and it seems likely that more funds will be allocated from other donors along a similar model. Practically, the investment board of the newly established subsidy and credit delivery mechanism under NRREP (CREF) seems positive towards continuing the MHDF in its present form as well. EnDev Nepal will seek stronger communication and coordination with the NRREP, and to integrate the EnDev targets and achievements into NRREP reporting.

The IWME pilot activity will be further evaluated, and an extension to the end of the year 2014, in preparation of a full up-scaling proposal for the next governing board meeting, will be covered with an additional EUR 100,000 from the current EnDev Nepal budget.

**PU:** Improved coordination is observed in all the CREEs. Stakeholder relations are good in both districts, and exposure visits were undertaken also to other districts and local trade fairs to share progress and increase visibility. The costs for the service provided by the ESPs are covered to some extent by cost sharing arrangements with the CREEs. To ensure PU promotion will be (seen as) a profit making business for CREEs, EnDev further supporting review and planning meetings.

## Further information

http://energypedia.info/index.php/Nepal_Country_Situation

# Nicaragua

| | | | | |
|---|---|---|---|---|
| **Promoted technology** | solar / stoves / hydro / grid | | | |
| **Project budget** | EUR 5,640,000 | **Spent until reporting date** | EUR 3,964,504 | |
| **Project period** | 10.2009 – 12.2014 | **Reporting period** | 12.2013 | |
| **Lead political partner** | Ministry of Energy and Mines (MEM) | | | |
| **Implementing organisation** | GIZ, HIVOS, BUN-CA | | | |
| **Implementing partner** | FODIEN, NGOs, local governments | | | |
| **Coordination with other programmes** | Programa Nacional de Electrificación Sostenible y Energías Renovables (PNESER) | | | |
| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
| Energy for lighting / electrical appliances in households | 49,000 | 38,405 | 40,748[26] | people |
| Cooking/thermal energy for households | 125,000 | 0 | 0 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 410 | 146 | 149 | institutions |
| Energy for productive use / income generation | 415 | 165 | 165 | SMEs |

## Project strategy and key components

The Electricity Industry Development Fund (FODIEN) was passed over to ENATREL (Empresa Nacional de Transporte de Energía Electrica), which is now coordinating the access activities within the national energy sector and is thus the major partner in planning and technical supervision of hydro power and national grid connected activities. Individual project implementation of PV activities is accomplished by linking actors such as NGOs, local governments and private enterprises with local communities or cooperatives under cost sharing agreements. Local partner organisations and users are trained in technical and management aspects of the technologies applied. The key components of the rural electrification activities are the installation and maintenance of renewable energy systems, such as solar home systems, picoPV, and micro, pico and small hydropower. Grid densification and extension is pursued in cooperation with MEM, ENATREL and the utilities ENEL (national electricity utility) and Disnorte/Dissur.

## Project progress (overall progress towards outcome target EnDev 2)

A total of 40,597 persons, 149 social institutions and 165 small and medium enterprises have been electrified during EnDev 2 until the end of December 2013.

**PV for households:** During the reporting period, 377 solar home systems were installed with the “Asociación para la Diversificación y el Desarrollo Agrícola Comunal (ADDAC)”. In cooperation with the NGO “Luciérnaga”, 26 picoPV Systems (Barefoot Connect 600) were distributed with local partners.

**Micro hydropower:** Another pico hydro power plant “Oro Verde” was installed in cooperation with “Exportadora Atlantic S.A”. The site has an electrical potential of 1.2 kW

[26] Due to a change in picoPV counting (see chapter C.2) figures of the previous reporting period are not directly comparable to current outcome figures.

and is connecting a farm with household and workers. The demand for pico hydro plants has dropped severely due to the crisis of the coffee sector, provoked by the coffee rust disease and a severe coffee price reduction of up to 50%, reducing the financial capacity of farmers.

Technical staff of Exportadora Atlantic S.A. was trained in the installation and use of pico hydro equipment in Matagalpa and Jinotega, the most important coffee-growing areas of the country. In cooperation with the micro hydro developer ASOFENIX, a capacity building programme for the improvement, operation and maintenance of six Micro Hydro Power Plants started with a technical training of local operators. A follow-up training in production of electronic load regulators was planned with the other micro hydro developer ATDER.

**Grid extension and densification:** A new nationwide grid densification project was planned and prepared with FODIEN-ENATREL, which will be coordinated by MEM. It is envisaged to connect a total of 4,423 households in rural and peri-urban areas.

**Improved cookstoves:** The Central American Fund for Access to Sustainable Energy and Poverty Reduction (FOCAEP) has approved three projects for the improvement of stove production and marketing. Three stove manufacturers are supposed to extend their production and marketing with about 3,000 improved cookstoves. A feasibility study for carbon financing of FOCAEP activities was implemented by Climate Focus in Nicaragua and Honduras.

In cooperation with MEM, a participatory process for the design and planning of the “National Program for the Sustainable Use of Fire Wood and Charcoal” was implemented with the most important actors of the value chain. EnDev Nicaragua has also actively participated in the SE4All planning process and Renewables Readiness Assessment (RRA) of IRENA for Nicaragua.

## Sustainability and handover strategy

Sustainability of achieved access and project outcomes is based on (a) a high own contribution of the beneficiaries for the purchase of the solar home systems, (b) training of the families and local technicians in handling and maintaining the systems and (c) a growing market penetration of solar products and services throughout the country. The exit strategy is based on gradual reduction of the EnDev subsidy in accordance with the market penetration and cost reduction of solar products and access to credit financing.

**Micro and mini hydropower plants:** Sustainability of the hydropower activities is based on the strong ownership and involvement of the actors with long term technical and management capacity development obligations with the operators, a strong commitment of the communities and users, and financially viable operation models. As individual projects are handed over to the operators and communities, the exit strategy is concentrated on local capacity development for operation and maintenance.

**Grid extension and densification:** The grid activities are embedded in strong and sustainable national ownership, while electricity service structures with a cross-subsidized tariff structure favour rural areas and customers with low electricity consumption.

**Improved cookstoves:** Beside the development of stove markets and local capacities for stove maintenance and after-sales services, sustainable financing mechanisms through micro financing strategies and carbon financing are the pillars of sustainability for FOCAEP. Its exit strategy is the diversification of financing sources before EnDev is phasing out.

# Peru

| | | | |
|---|---|---|---|
| **Promoted technology** | solar / stoves / grid / others | | |
| **Project budget** | EUR 11,350,000 | **Spent until reporting date** | EUR 8,451,235 |
| **Project period** | 06.2009 – 12.2015 | **Reporting period** | 12.2013 |
| **Lead political partner** | Peruvian Agency for International Cooperation APCI | | |
| **Implementing organisation** | GIZ | | |
| **Implementing partner** | Ministry of Energy and Mines, Ministry of Agriculture, Ministry of Health, Ministry of Development and Social Inclusion, governments of regions and provinces, private companies (especially mining, utilities). Micro Finance Institutions: ADA, MEI | | |
| **Coordination with other programmes** | Program for Competitiveness – AGROIDEAS from the Ministry of Agriculture; Project for the improvement of the rural grid through a grant fund – FONER; MFIs: Fondesurco; Caja Huancayo | | |

| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 175,000 | 186,123 | 212,806[27] | people |
| Cooking/thermal energy for households | 310,000 | 647,030 | 651,495 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 4,800 | 2,810 | 3,143 | institutions |
| Energy for productive use / income generation | 2,600 | 5,131 | 7,111 | SMEs |

## Project strategy and key components

**Grid extension**: EnDev developed the "Safe Rural House" strategy to promote grid connections and safe in-house installations, addressing three aspects: 1) awareness raising about the importance of safe installations; 2) training of local technicians on installation, management, and access to quality supplies; 3) cooperation with utilities regarding grid connection of households.

**SHS/picoPV**: The government promotes SHS installed by private contractors and managed by regional utilities on a fee-for-service basis. EnDev provides technical assistance during tendering and participates in the implementation by informing and educating users about operation and maintenance, hence improving the sustainability of the SHS. EnDev arranged testing and quality assurance for a number of picoPV systems. Alliances have been built with three importers and supply chains are developed at regional level. Local markets are stimulated through awareness raising.

**Improved cookstoves and thermal energy**: On the supply side, EnDev strengthens commercial structures (capacity building for rural entrepreneurs, a pilot project concerning microcredit for portable ICS). On the demand side, EnDev developed several tools, shared and integrated into the partners' knowledge management: healthy cooking environments, a maintenance and good use campaign, and "Amigas y Amigos de la Energía" for awareness raising in schools. An RBF-oriented pilot on solar water heaters is currently implemented to stimulate the market for SWH in rural areas. Three SWH companies and one MFI participate.

[27] Due to a change in picoPV counting (see chapter C.2) figures of the previous reporting period are not directly comparable to current outcome figures.

**Energy for productive uses and income generation**

EnDev partners with MFIs to promote energy access for individual entrepreneurs. Market studies and studies on acceptance of solar driers and portable ICS are conducted. Business training documents and manuals on proper use and maintenance have also been elaborated.

## Project progress (overall progress towards outcome target EnDev 2)

**Grid extension**: Three utilities will include the safe rural home concept in their grid expansion activities. EnDev supports electricians who sustain a regular income by offering safe electrical installations. This service is promoted via radio, videos and flyers. EnDev formed alliances with electrical equipment companies for a discount on quality materials sold in rural areas.

**SHS/picoPV**: Regional utilities have delivered SHS to almost 8,000 clients, accompanied by information and educational material provided by EnDev. EnDev's training workshop will be conducted by the Energy Ministry for more than 1,000 entrepreneurs. An alliance with Peru's largest utility on technical assistance concerning solar energy is under development. picoPV: 20 distributors have been trained. These have sold close to 1,500 systems so far.

**Improved cookstoves and thermal energy**: EnDev formed the thematic group of energy for cooking, a platform of 16 public and private institutions with the aim of creating visibility, knowledge, and advocacy for ICS. On the supply side, entrepreneurs have been trained, increasing their sales of ICS in the last eight months by 40% on average. In zones without entrepreneurs, viable supply chains have been identified. Portable ICS were incorporated by one MFI as part of their credit schemes. On the demand side, EnDev supported institutions training families on healthy cooking environments. 200 installers were trained with this methodology. EnDev works with the Ministry of Education on integrating the "Amigas y Amigos de la Energía" into their work. Two ministries received technical assistance concerning social ICS programs. Three SWH companies have become involved in the RBF-oriented pilot project starting end of 2013. 20 SWH have been installed, in addition to ten credits awarded by a MFI.

**Energy for productive uses and income generation**

EnDev provides technical assistance to MFIs which are extending energy-related products to more agencies. A market study is conducted in order to include picoPV in MFI credit schemes EnDev developed agribusiness degrees in seven regions together with Agroideas and one university; trained 280 business plan creators; and developed manuals on the mechanisation of processing agricultural products in twelve production chains.

## Sustainability and handover strategy

EnDev designs strategies to work with public and private institutions at the national, regional, and local levels for sustainable energy in rural areas. To achieve this, EnDev uses a market approach that develops commercial structures, proposing suitable technologies. This means: working on the promotion of products (demand-side); training and research on products (supply-side); and strategic policy alignment for promoting investment in the energy market.

## Further information

Web page: www.endevperu.org; Magazine on energy access: https://energypedia.info/wiki/Amaray_Magazine_-_Energising_Development_Peru

Online monitoring system (password available on request): monitoring.endev.info

# Rwanda

| | | | |
|---|---|---|---|
| **Promoted technology** | hydro / biogas / solar | | |
| **Project budget** | EUR 15,490,000 | **Spent until reporting date** | EUR 4,179,227 |
| **Project period** | 10.2009 - 12.2017 | **Reporting period** | 12.2013 |
| **Lead political partner** | Energy, Water and Sanitation Authority (EWSA) / Ministry of Infrastructure (MININFRA) | | |
| **Implementing organisation** | GIZ | | |
| **Implementing partner** | EWSA/ MININFRA, Private sector (MHP) | | |
| **Coordination with other programmes** | World Bank, ESME/GVEP, BTC, SNV | | |

| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 1,008,090 | 16,550 | 19,696 | people |
| Cooking/thermal energy for households | 20,544 | 8,730 | 9,300 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 0 | 0 | 0 | institutions |
| Energy for productive use / income generation | 0 | 0 | 0 | SMEs |

## Project strategy and key components

**PSP Hydro**: The project “Private Sector Participation in Micro-Hydropower Supply for Rural Development” (PSP Hydro) aims at developing a private hydropower sector in Rwanda. To achieve this target, EnDev continues to focus on two key interventions: technical, financial and business management support to private sector firms for the development of micro hydropower plants (MHPPs) and institutional support to consolidate the participation of private MHPP developers in the energy sector. This approach has been described in more detail in previous reports.

**Biogas**: EnDev has been supporting the National Domestic Biogas Programme (NDBP) during its first phase (2007-2011). It was implemented by the Ministry of Infrastructure (MININFRA) with technical support from EnDev and SNV. Since 2012 the NDBP is run by the Ministry without EnDev support.

**Results-Based Financing (RBF) for Solar Lighting and Village Grids**: EnDev provides financial incentives to motivate private sector actors to invest in solar lanterns and mini-grids and extend their sales activities to reach more people in rural areas. This limited and time-bound financial support for off-grid technologies will kick-start underdeveloped markets and will help to overcome market barriers. The project will be implemented by a Rwandese bank. EnDev will assist in setting up the project, provide technical backstopping and monitor the correct use of funds by the financial institution.

## Project progress (overall progress towards outcome target EnDev 2)

**PSP Hydro**: The third EnDev supported MHP plant, Musarara (438 kW), started production in February, 2013. All three EnDev supported MHP plants have been operating without problems since their commissioning. The target for phase 2 of providing 19,700 people with access to electricity has been achieved.

In addition, four projects are at various stages of project development. For the Kavumu project (285-350 kW), a French equity investor got involved and final negotiations are underway. As soon as negotiations are finalised, the grant agreement with EnDev will be negotiated and construction will start. The developers of the Mashyiga project (140 kW) have received the approval of their business plan from EWSA and are starting PPA negotiations while discussing with local banks to obtain a commercial loan. After finalising the Musarara project, the developers are proposing to increase the capacity of this plant to around 1.2 MW; they have delivered a draft feasibility study to obtain PSP Hydro support. The Gasumo project has seen a transfer of ownership to a new developer.

At the policy level, in 2013, an extensive consultation process took place on the adaptation of the feed-in tariffs for hydropower. PSP Hydro, together with several Independent Power Producers (IPPs), provided extensive comments into this process. As renewable energy feed-in tariff (REFIT) tariffs were seen as too low to allow the development of smaller projects, the consultancy will publish recommendations in early 2014. As a result, the feed-in tariffs will likely be adjusted upwards.

On initiative of PSP Hydro, an ad-hoc technical team of hydropower staff was formed in EWSA, which also included other relevant stakeholders like Rwanda Development Board (RDB), Rwanda Utilities Regulatory Agency (RURA) and MININFRA to adapt this process for MHP sites. The newly established Energy Investment Unit in EWSA has been taking on a central role in coordinating all relevant processes in the application of IPPs. PSP Hydro is collaborating closely with this unit and providing support where needed. In the future, the Investment Unit will take on a leading role for the implementation of the next phase of the PSP Hydro project.

The growth of the MHP private sector can be clearly observed. Three more projects by new implementing partners are under study and close to financial closure. The companies that already completed a project have all started to work on new projects, either with PSP Hydro, or with other partners. Several other companies expressed their interest in developing a micro hydropower plant: about 16 IPPs have applied to EWSA to develop private MHP projects but are discouraged by the lack of funding and the low REFITs. In addition, three firms that work with PSP Hydro have started spin-off projects financed by the World Bank, with limited technical support by the PSP Hydro project.

Recently the PSP project supported EWSA’s Energy Investment Unit and MININFRA in privatising four micro-hydropower plants under a 25-year concession agreement; the tender process was launched in May. Additionally, EWSA has started a process to privatise six additional MHPPs that were recently completed and are presently operated by EWSA.

In the area of pico-hydro, EnDev, in cooperation with GVEP, organised a hands-on training on hydropower scouting / plant design with an international trainer from Germany. The one-week training brought together 20 hydropower entrepreneurs in a remote area where many pico-hydropower sites have been developed by small-scale entrepreneurs. While the technical capacities of these entrepreneurs are still relatively low, the training saw very good participation and enthusiastic engagement from participants. GVEP is preparing a follow-up training on business management. The Wallonian Air and Climate Agency (AWAC) awarded funds for long-term technical support to pico-hydro entrepreneurs and for the development of one pilot site to SNV. SNV intends to align their programme closely with the existing initiatives by EnDev and GVEP. This activity was carried out as a preparatory step for RBF, to enhance the likelihood that project developers are able to submit quality applications as soon as the RBF programme starts in early 2014.

**RBF**: EnDev Rwanda is about to start the implementation of the two results-based financing projects (village grids and solar lighting) provided by the private sector. An “Operations Manual” for the applying banks that outlines the mechanisms of the programme has been drafted, and the bank selection process is almost finalised. In December, three project proposals have been received from banks; a project manager will be hired to oversee project implementation.

**In the biogas sector**, by December 2013, a total of 3,459 digesters of sizes between four and ten $m^3$ have been built within the implementation of the NDBP. As a result, 9,300 people gained access to biogas technology in Rwanda that can be attributed to EnDev.

## Sustainability and handover strategy

**PSP Hydro**: The successful implementation of three private hydropower projects in Rwanda shows that the technical support and the grant provided is enough to reach technical and financial feasibility for such projects. As a result of the private sector approach and the strong ownership of developers, individual projects developed by PSP Hydro are expected to successfully operate after the termination of the project in Rwanda. Also, the regulatory and policy framework has considerably improved during the last years. However, there is still a need for more private companies active within the hydropower sub-sector to make it sustainable and self-growing. The establishment of a clear investment process that outlines the steps and permits required from IPPs provides more clarity for companies and allows them to hold the different institutions to account. Especially the establishment of the Energy Investment Unit in charge of IPPs is a very positive development, as this unit is taking on an increasingly strong coordinating function. In the future, this unit might fulfil the role of a one-stop shop for private investors, which in the past was often fulfilled by the PSP Hydro project. However, while the number of private companies active in the hydropower sub-sector in Rwanda is slowly increasing, companies still need to consolidate their business to make this new sector sustainable.

**RBF:** The underlying hypothesis of results-based financing is that targeted financial incentives to the private sector can be an effective instrument to overcome specific market inefficiencies or growth barriers, thus “lifting” these markets to a new, more efficient volume. RBF scale economies will then result in reduced unit prices, which in turn forego the need for further subsidies. Therefore, the RBF will be reduced gradually, in order to provide incentives for “early subscribers”, who can be expected to encounter more obstacles in developing the value chain, as well as to phase out the financial incentive to return to normal market conditions. RBF support is 100% of the maximum total RBF incentive only in the first year, while support is reduced by 20% in each subsequent year. Market development will be continuously monitored, also in order to remove the subsidy as soon as possible and return to pre-RBF market conditions.

# Senegal

| | | | |
|---|---|---|---|
| **Promoted technology** | solar / stoves / grid | | |
| **Project budget** | EUR up to 10,870,000[28] | **Spent until reporting date** | EUR 9,829,302[29] |
| **Project period** | 04.2009 – 12.2014 | **Reporting period** | 12.2013 |
| **Lead political partner** | Ministère en charge de l'Energie (MEM) | | |
| **Implementing organisation** | GIZ | | |
| **Implementing partner** | Direction de l'Energie, Agence Sénégalaise de l'Electrification Rurale (ASER), Agence Nationale des Energies Renouvelables (ANER), Agence pour l'Economie et la Maîtrise de l'Energie (AEME) | | |
| **Coordination with other programmes** | Promotion of Renewable Energies, Rural Electrification and Sustainable Supply of Household fuels (PERACOD) | | |

| **Target (number of beneficiaries)** | **Target till project end[30]** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 59,700 | 14,414 | 22,080 | people |
| Cooking/thermal energy for households | 500,000 | 415,701 | 549,624 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 549 | 57 | 57 | institutions |
| Energy for productive use / income generation | 145 | 0 | 0 | SMEs |

The EnDev Senegal programmes comprises two major components: a) FASEN (improved cookstoves) and b) ERSEN (rural electrification). They are reported in separate sections. ERSEN has been extended with an EU-co-funded electrification project (PASES).

## FASEN: Promotion of improved cookstoves

### Project strategy and key components

FASEN focusses on (1) further scaling up the production and promotion of charcoal and fuel wood stoves (ICS) in the new rural areas of EnDev 2, (2) fostering the local production in the peri-urban areas of the EnDev 2 project areas, (3) further increasing the mechanisation of ICS production of successful enterprises in the old EnDev 1 urban areas, (4) fostering the quality assurance of ICS, and (5) developing and piloting cleaner advanced cookstoves.

### Project progress (overall progress towards outcome target EnDev 2)

FASEN reached its outcome target for this phase (109%) with an increase of 32% in comparison to the last reporting. After a period of stagnation of stove sales in 2011 and first semester 2012, the sales have now increased for the third semester in a row. While the overall result is satisfying, there are differences between the intervention zones. Dakar

[28] EnDev Budget EUR 8,500,000, EU co-financing budget (PASES) up to EUR 2,370,000.
[29] Including costs for PASES.
[30] Including PASES targets of 2786 households, 244 social institutions and 50 SMEs connected in 121 villages.

repeated its record sales from the previous semester at an all-time high. Its overall market share is 62%. Kaolack registered a 75% increase of sales compared to the previous report and a market share of 19%. This increase is the result of massive interventions in the areas of communication and awareness (e.g. public events and contracts with three radio stations).

The other implementation areas have a lower market share. In all these three areas, supervisory capacities were strengthened in this semester and communication and awareness activities were intensified. All three areas registered increases in stove sales compared to the last semester. However, absolute sales in these areas are not yet at satisfactory levels. With 12 months remaining until the end of the current phase, FASEN will work towards further increase of sales. This applies particularly for the rural areas, where sales are growing but still remain at low levels.

FASEN imported 100 highly efficient and clean burning institutional cookstoves (InStove) for demonstration at the Magal Touba festival and for market testing. A multi-agency partnership will be formed to assess the feasibility of a local production of these stoves in 2014.

The Éclair stove was adapted to Senegal and named Taaru. In St. Louis and Louga, the stove was sold on a small scale. Based on the experiences of users and producers, the stove design will be reviewed in the first semester 2014 in preparation of the scaling-up.

FASEN continues to assess the techno-economic feasibility of the production of pellets and briquettes from Typha for the use as cooking fuel in gasifier cookstoves. Within a Public Private Partnership with a Senegalese company, machines for the production of pellets and briquets from Typha have been delivered to Senegal. Implementation of activities will start during the first half of 2014.

### Sustainability and handover strategy

One of the major factors in the strategy is the professionalisation of crafts including blacksmiths and potters. Well-performing producers were offered co-funding for the investment in more effective tools and equipment. This increases the profitability of the business and therefore the interest of the producers to maintain their engagement in the sector. The introduction of labels assists the qualified producers to distinguish their products from low quality stoves on the market.

Another important focus of the 2nd semester of 2013 was the increased involvement of both technical services and local authorities in implementing the production and distribution of ICS in all our areas of intervention, continuing to support the sector beyond the end of FASEN.

### Further information

12,075 improved cookstoves were sold in the second semester of 2013 in the EU–EnDev co-funded program ProCEAO in Senegal, an increase of 26% compared to the first semester.

## ERSEN promotion of rural electrification

### Project strategy and key components

ERSEN provides technical and financial support to the Senegalese Rural Electrification Agency (ASER) in electrifying interested rural villages in mini-concessions (ERILs) given out by ASER through SHS (small villages), mini grids (villages up to 1000 people) or grid extension (larger villages). Activities take place in two zones in Senegal, the Peanut Basin (BA) and the Casamance. In addition to household electrification, several social institutions are electrified as well. The systems are operated and maintained on a fee-for-service basis

by five private operators. ERSEN 2 essentially is an extension of ERSEN 1, i.e. electrification of more villages according to the same strategy.

Parallel to ERSEN, EnDev Senegal is implementing, with co-funding from the EU, a rural electrification programme in the Sedhiou province in the Casamance under the acronym PASES.

## Project progress (overall progress towards outcome target EnDev 2)

The last progress report foresaw 15,000 people connected during the second semester of 2013, bringing the total to 30,000. Approximately half of this objective was achieved. At the same time, the allocated budgets for electrification by EnDev and PASES is already used to a large extend. As biannual targets were missed repeatedly, an extensive review was carried out. ERSEN 2 should achieve its target in eleven lots of villages to be electrified. In consultation with PERACOD and the operators, the perspective of each lot was discussed:

- Three lots (1 SHS, 2 mini-grids, operators EnergieR and Sudsolar) are completed, serving 11,000 people in 41 villages.
- Two lots (1 SHS, 1 mini-grid, operator NSResif) are nearing completion and will be completed during 2014, hence by the end of the programme. Currently serving 6,500 people, their number will increase to approximately 11,000 in 38 villages.
- One SHS lot (operator Salensol) currently serves 4,000 people, its completion by the end of the year is realistic. The original 13,000 target for this lot seems over-estimated and should be lowered to approximately 8,500 people in the 40 villages concerned.
- The Enersa mini-grid lot should eventually serve 8,500 people in 18 villages. Grids and civil works are completed and Enersa started the installation of powerhouses. With their (large) workforce, completion by the end of the year is feasible; however, additional investments for indoor installation are still required. With current budgetary constraints, delays beyond December 2014 can thus not be excluded.
- Four operators have each a grid-connection lot. In 16 relatively large villages nearly 19,000 people should be connected. Village grids are finalised and in some villages also indoor installations were made. However, additional hardware investments are required, which may cause delays. More importantly, completion depends on a string of unsettled contracts and agreements involving several agencies. These processes are not under the control of ERSEN and history shows that they take far longer than foreseen. In fact, only recently the first ever ERIL contract was signed. While this is a positive sign, a realistic timeframe for completing these lots can hardly be given.

In addition, most of the remaining work should be carried out by the respective operators, with only adjacent tasks for PERACOD / GIZ. However, with the coordinator having left the programme recently and him not yet being replaced, internal progress at present is slow. Hence, most results of 2014 will be achieved during the second semester.

Summarising: In the first semester of 2014, ERSEN outcome will hardly rise. By the end of the year the number of people connected will reach 30,000 and, if additional hardware investments for Enersa can be made in time, this number can go up to 39,000. A realistic timeframe for the connection of another 19,000 beneficiaries is hard to give. When these are eventually connected, ERSEN 2 outcome would rise to 58,000. With additional connection in ERSEN 1 villages, the original 59,700 target can be achieved. In the framework of the co-financing with the EU, EnDev Senegal has expanded its interventions in the area of Sédhiou with an additional 50 villages. Substantial hardware investments have been made so far, but for completion more inputs are required.

## Sustainability and handover strategy

As identified before, the current revenues of operators are ample to cover daily operation but seem insufficient to replace hardware when due. However, available data is still insufficient to quantify these effects. A model was designed to assist, following the business case of each operator; this should now be rolled out. In addition, RWI is planning a study comparing the business case of the operators. It is anticipated that the conclusions of the study will highlight the need for a tariff revision.

# Tanzania

| | | | | |
|---|---|---|---|---|
| **Promoted technology** | solar / stoves | | | |
| **Project budget** | EUR 2,041,000 | **Spent until reporting date** | EUR 96,120 | |
| **Project period** | 12.2012 – 6.2017 | **Reporting period** | 12.2013 | |
| **Lead political partner** | Ministry of Energy and Minerals | | | |
| **Implementing organisation** | SNV in cooperation with GIZ | | | |
| **Implementing partner** | Stove producers and retailers, food vendors, Solar companies | | | |
| **Coordination with other programmes** | The Lake Zone Consortium; Agricultural extension society TSAEE; GIZ Programme on Renewable Energy | | | |
| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
| Energy for lighting / electrical appliances in households | 181,970 | 0 | 0 | people |
| Cooking/thermal energy for households | 45,000 | 0 | 5,159 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 0 | 0 | 0 | institutions |
| Energy for productive use / income generation | 1,000 | 0 | 0 | SMEs |

## Project strategy and key components

The overall project strategy of EnDev Tanzania is to develop markets and a sustainable supply for the ICS as well as for solar picoPV technology in urban and peri-urban areas in the Lake Zone area. For the latter, a Results-Based Financing scheme (RBF) is being applied involving private companies.

The Tanzania Improved Cook Stove (TICS) project will introduce and promote appropriate cooking technology options to currently underserved biomass consumers – rural firewood-using households and urban charcoal-using small commercial food vendors. This component of EnDev Tanzania supports the development of a viable production, marketing and supply chain for portable and fixed models of newly-developed 'Matawi' ceramic wood-burning stoves in rural and peri-urban areas of the Mwanza region. In the urban environs of Mwanza, TICS further supports small and medium scale ICS manufacturers.

The Results-Based Financing picoPV project aims at improving market access for rural and off-grid households using quality solar lanterns, phone chargers and small multi-room lighting kits, through the establishment of a temporary financial product.

## Project progress (overall progress towards outcome target EnDev 2)

In reference to the outcome figures above, a total of 758 rural wood stoves were sold during the reporting period. Additionally, 102 multi-spot charcoal stoves have been sold in urban markets. Rural components of TICS have been constrained by a fatal vehicle accident suffered by the local partner during project implementation.

TICS phase 1 of implementation during July-December of 2013 has been focussing on the following activities:

1. Traditional ICS diversification: Building upon the initial technical training, EnDev Tanzania has provided continued coaching and quality control support through bi-weekly visitations to

all producers in the programme. As of the end of December 2013, four out of five rural ceramic artisans trained in the programme are actively engaged in the Matawi stove production and sales, and two out of three urban small enterprises in the charcoal ICS production are active in the multi-spot ICS production and sales.

2. Tangible marketing: The main thrust of this component of TICS during the period of July-December has been the testing and refinement of market entry approaches; supporting marketing tool development; and development of product branding to distinguish ICS product and service delivery from inferior imitations and competitors. Promotional materials have been developed, market tested and refined for the production of leaflets, flyers and stickers. All promotional materials include a TICS slogan 'Enjoy Cooking Today', employ the use of a product logo and indicate service provider contacts.

Support to the market entry of wood burning Matawi stoves has begun in four rural wards of Misungwi District through the use of youth groups (17-25 years of age) trained and coached in stove principles, installation, sales, and services with initial capability of selling around 10 to 30 units per month. Market entry support to multi-spot stoves has been employed combining the placement of products with food vendors and/or traditional market retailers who act as a commissioned agent for continued sales.

3. Targeted enterprise development services: Based on broad issues that are encountered in the delivery of the elements referenced above, TICS organises entrepreneurship seminars with relevant actors throughout the value chain. An approach of problem-based learning is deployed, focussing on providing practical entrepreneurship skills in resolving actual challenges encountered in the production, marketing and sales of stoves.

The RBF fund for picoPV in Tanzania will be open to the private sector from May 2014 until September 2017.

## Sustainability and handover strategy

The handover strategy for EnDev activities is based on a strong focus on capacity development- and/or performance-based programmatic support that ultimately improves consumer access to marketable energy technology options. For instance, SNV discourages interference at customers' level and works diligently to design and implement approaches that motivate the growth of the strongest performers in local supply chains.

TICS avoid any means that result in directly subsidised products to consumers. Further, producers access additional equipment, supplies and specialised training based on their adherence to quality standards and the volume of their production. As the rural sector continues to expand, TICS intends to open up access to performance-based marketing incentives to wider segments of actors in the supply chain.

Inherent to the design of the RBF for picoPV approach, the private sector must actually pre-finance their sales activities before they are able to earn any financial incentives. Ownership of the RBF scheme by the private sector is considered to be very high, with companies identifying, even before the public posting of the call, financing to support the expansion to the Lake Zone. Further, the value of the RBF incentives applied to each unit of picoPV will be objectively calculated annually by SNV, based on the performance of each picoPV product and an annual product incentive cap. As the market develops and economies of scale are achieved, annual product incentives will decrease by 25% each year in which the RBF fund is open.

# Uganda

| | | | |
|---|---|---|---|
| **Promoted technology** | solar / stoves / hydro / grid | | |
| **Project budget** | EUR 14,500,000 | **Spent until reporting date** | EUR 5,568,510 |
| **Project period** | 04.2009 – 12.2017 | **Reporting period** | 12.2013 |
| **Lead political partner** | Ministry of Energy and Mineral Development (MEMD) | | |
| **Implementing organisation** | GIZ | | |
| **Implementing partner** | Rural Electrification Agency (REA), NGOs, Private Project Developers | | |
| **Coordination with other programmes** | GIZ programmes at the Office of the Prime Minister (OPM) and Financial Sector Development (FSD); Energy for Rural Transformation (ERT) II Programme financed by World Bank, especially with regards to the Photovoltaic Targeted Market Approach (PVTMA) | | |

| **Target (number of beneficiaries)** | **Target till project end**[31] | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 52,500 | 29,991 | 21,074[32] | people |
| Cooking/thermal energy for households | 600,000 | 262,775 | 228,910 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 238 | 169 | 220 | institutions |
| Energy for productive use / income generation | 2,500 | 275 | 392 | SMEs |

## Project strategy and key components

EnDev Uganda comprises four components: a) improved firewood stoves (fixed and mobile mud stoves (ICS), b) photovoltaic systems, c) grid densification, and d) micro hydro.

EnDev facilitates the dissemination of ICS for households with a market-based approach, offering technical and business skill training as well as promotion and marketing.

Commercial dissemination of PV systems for households, enterprises and social institutions in rural areas is facilitated through technical and business skills training, as well as marketing and promotion. In cooperation with the local district government and the Peace, Recovery and Development Plan (PRDP), EnDev supports access to solar home systems (SHS) for social institutions (SI) also through a direct subsidy.

EnDev Uganda cooperates with the Rural Electrification Agency (REA) in the field of grid densification for electrifying trading centres and surrounding villages, following a community-based approach. Thereby, communities apply for grid connection and become usual customers of the energy supply company afterwards.

[31] These targets were set in the latest up-scaling proposal with EUR 6.5 million co-financing by EUEF, which was still subject to approval by EC. According to EC decision of Mid-March 2014 this proposal was not approved. Therefore, project budget, duration and target have to be revised. A respective up-scaling proposal update is provided with the Annual Planning Update 2014.

[32] Due to a change in picoPV counting (see chapter C.2) figures of the previous reporting period are not directly comparable to current outcome figures.

## Project progress (overall progress towards outcome target EnDev 2)

The implementation of the new ICS approach started beginning of 2013 and continued throughout the second half of the year. The decreasing number of reached people is explained by the fact that not all stoves reaching the end of their lifespan were replaced. Due to modifications of the approach, the stove adoption rate was not as fast as it should have been to replace all worn-out stoves. Until now, 116,303 stoves were built in 14 districts in Northern and Eastern Uganda. Since June 2013, additional 102 stove builders have been trained in three districts through Trainers of Trainers (ToT) according to the Energy Service Providers (ESP) concept. In addition, a qualified local consultant was engaged to develop a tailor-made business training concept to support the stove builders with deeper knowledge on material supply management, production and sales planning, marketing, professional behaviour, access to finance, etc. The business skill training has been fully implemented in four districts in Lango region before the end of 2013. Since September 2013, EnDev Uganda is in discussion with the MEMD to establish an ICS logo to brand ESPs and their products in preparation for the upcoming marketing and promotion campaign. The development of the stove database "STOVEN" made an important step forward and will be used for the next reporting period. In addition to that, ten types of stoves will be tested in the 1st quarter 2014 for safety and technical performance.

Solar market development interventions have continued to follow a two pillar strategy: a) continuous support to rural-based solar dealers – or their outlets in rural areas – with technical and business trainings, and b) tailor made marketing and promotion campaigns within the framework of the quality brand “access to solar”. EnDev Uganda partnered with the Rural Electrification Agency (REA) and their PV Target Market Approach Project (PVTMA) for a joint promotion campaign covering the whole country with eight large solar trade shows accompanied by a radio campaign. The partnership with the solar company Solar Sense Ltd., with the objective to establish two outlets in two districts where no solar company was present, has been completed successfully; almost 200 solar systems were installed. The cooperation with Small Solutions (distributor of Greenlight Planet and Fosera products) has been continued as a payment in instalments in cooperation with a large farmers-association. The cooperation with PRDP advanced successfully to the next implementation step. Five district local governments from Northern Uganda secured their financial contributions to solar PV systems for 30 SIs (schools, health centres and rural administrative offices).

The agreement with REA in 2012 to work jointly on grid densification projects for rural communities continued successfully. A total of 171 connections were created and 1,323 people were reached. The respective communities were mobilised and supported in organising the collection process for their financial contribution (30% of the costs of the low-voltage line). The remaining costs will be fully covered by REA.

## Sustainability and handover strategy

Sustainability for ICS is ensured through the market-based approach, as the project supports the development of market structures. Through quality control checks as well as marketing and promotion, the reputation of and knowledge about the technology is expected to create a solid demand by end-users.

The programme focusses on creating a sustainable PV market through a viable network of rural solar dealers, financial institutions and equipment suppliers from Kampala. Quality control and tailor-made technical trainings as well as promotion and marketing campaigns ensure trust in and knowledge about the products, boosting sales.

For the grid densification projects and MHP projects, the legal hand-over strategy is similar. All projects will be handed over to REA, as they are in charge of coordinating and steering the local power supply companies. For grid densification this means that once connected to the grid, all people reached are usual customers of the power supply company UMEME. For the micro hydro power (MHP) projects the community operator receives backstopping to ensure sustainability.

# Vietnam

| | | | |
|---|---|---|---|
| **Promoted technology** | biogas | | |
| **Project budget** | EUR 3,740,000 | **Spent until reporting date** | EUR 322,040 |
| **Project period** | 07.2013 – 06.2017 | **Reporting period** | 12.2013 |
| **Lead political partner** | Ministry of the Agriculture and Rural Development (MARD) | | |
| **Implementing organisation** | Netherlands Development Organisation (SNV) in cooperation with GIZ office Vietnam | | |
| **Implementing partner** | Biogas Project Management Unit (PMU) | | |
| **Coordination with other programmes** | Asian Development Bank: Quality and Safety Enhancement of Agricultural Products and Biogas Development Project (QSEAP); World Bank: Livestock Competitiveness and Food Safety Project (LIFSAP); Financial Institutions: TYM/Coop Bank, Facet | | |

| **Target (number of beneficiaries)** | **Target till project end** | **Achieved till 06.2013** | **Achieved till reporting date** | |
|---|---|---|---|---|
| Energy for lighting / electrical appliances in households | 0 | 0 | 0 | people |
| Cooking/thermal energy for households | 275,000 | 0 | 39,165 | people |
| Electricity and/or cooking/thermal energy for social infrastructure | 0 | 0 | 0 | institutions |
| Energy for productive use / income generation | 0 | 0 | 0 | SMEs |

## Project strategy and key components

The RBF project is aiming at facilitating sector transformation away from subsidies, and thereby to create a market-driven domestic biogas sector in Vietnam. The four year project implementation period is divided into two phases. Phase 1 (mid-2013 to mid-2015) is dedicated to further designing and piloting a new RBF mechanism in seven provinces, incentivising private biogas mason enterprises (BMEs), increasing the responsibility and accountability of the private sector, moving the core components of the programme towards a market mechanism and strengthening institutional support through capacity building of the Vietnam Biogas Association (VBA) (non-EnDev funded) – all to accelerate market growth through increased (fully commercial) sales of biogas digesters. In 2014 and early 2015, the pilot will be evaluated. Phase 2 (mid-2015 to mid-2017) will focus on applying the lessons learnt from the pilot onto the rest of the country, and starting the phasing out of the RBF component in the initial pilot provinces (2016).

## Project progress (overall progress towards outcome target EnDev 2)

The outcome results reported are based on the business as usual incentive approach which has continued in 2013 in order to maintain the networks and reputation of the programme for a smooth transition to the new approach. In parallel, the preparations of the new RBF progressed.

A concept for a commercialised quality control (QC) mechanism has been developed. The new RBF-based QC mechanism will have a lower intensity of QC for experienced BMEs, reduced costs (paid by the market) and a reduced responsibility for Government officials - while safeguarding the quality of the supply chain. The identification process for the QC service providers is progressing. However, in some provinces the intensity of quality controls

required may not provide enough revenue for individuals (e.g. due to long travel distances) to make a living from this activity. To address this, the programme will offer a basic salary to qualified independent quality verifiers, even if there is not sufficient work available. The district technicians remain a fall back option in case a market approach for QC is found to be not feasible.

The RBF incentive will be directly linked to this QC mechanism. The QC mechanism defines the required results for each BME. Only after successfully finalising the QC monitoring and procedures the RBF incentive will be paid to the BME.

For an optimal learning experience, seven RBF-pilot provinces have been selected with very different track records, BMEs and geographic characteristics. At the time of reporting, six of these provincial biogas representations have officially confirmed their participation (one feedback pending).

An important innovation in the reporting period is the preparation for the opening of the biogas programme towards other biogas digester models in the pilot areas, starting with the composite models. The inclusion of this technology in the RBF has been discussed with the producing companies. A quality control procedure specifically designed for composite biogas plants has been developed. Consultations with MARD and MOST have started for the formulation of a national quality control standard, if possible in cooperation with ADB.

The development of the new training outlines with innovative approaches has started. It is planned for 2014 to open the training to all (aspiring) BMEs and composite retailers in the market. Existing BMEs and composite retailers will receive a biogas enterprise RBF training, which focusses on effective selling skills, quality self-assessment, general business skills and end user training. BMEs will have to pay for the trainings.

The BMEs will start to actively promote (existing) microfinance loan mechanisms for the purchase of biogas digesters. This approach is part of the Finance for Access to Clean Energy Technologies in South and South East Asia (FACET) programme, which has been discussed with UNEP and Coop bank and which will come into operation in 2014.

The successful preparations in the last six months of 2013 have enabled the programme to initiate the trial of the RBF design. The kick-off is scheduled after the annual project meeting with all the province representatives (27-28$^{th}$ of February 2014), while the training component will commence in April/ May 2014. The first systems will be built and accepted in the RBF project immediately after.

## Sustainability and handover strategy

The core idea of the current phase of the Vietnam Biogas Program is to develop, test and scale up a more sustainable approach for the promotion of biogas technologies. After six months, concepts have been elaborated and some crucial steps have been taken.

Most concepts and activities initiated so far in respect to increasing sustainability have been described in the previous section.

In the original proposal, a large responsibility was foreseen for the VBA. The capacity of the VBA unfortunately develops less quickly than was initially foreseen. This poses a challenge to the handover strategy. In one of the pilot provinces (Hai Duong) there is however a rather strong provincial representation of the VBA. This organisation will take on the responsibilities that were previously with the provincial authorities. Therefore, it is possible to pilot the approach from a provincial level instead of top-down from a national level.

## E. Budget allocation and expenditures

Out of the total budget of EUR 202,934,943 an amount of EUR 169,228,000 has been allocated to activities in the different countries.

| **Allocation of EnDev 2 Budget** | |
|---|---|
| allocated to projects based on EnDev 2 Annual Planning 2014 | 168,733,000 |
| allocated to projects based on EnDev 1 Annual Planning | 495,000 |
| allocated to program level activities | 14,000,000 |
| not allocated | 19,706,943 |
| *thereof reserved for RBF facility* | *18,144,513* |
| **Total** | **202,934,943** |

The total expenditures of EnDev 2 until December 2013 amount to 107,479,025 EUR.

The total expenditures in 2013 are 31,583,921.32 EUR.

| **Donor funding** | **EnDev 2 Funding** | **Disbursements** |
|---|---|---|
| | | |
| **EnDev 2 program** | **202,934,943** | **107,479,025** |
| | | |
| **Governing Board Donor funding** | | |
| BMZ funds | 41,800,000 | 21,878,517 |
| DGIS funds | 72,000,000 | 61,172,735 |
| MFA Norway funds | 22,550,000 | 7,038,464 |
| DFAT funds | 15,844,000 | 13,754,606 |
| DFID funds | 37,156,000 | 568,596 |
| DEZA funds | 7,500,000 | 0 |
| **Additional Donor funding** | | |
| Irish Aid | 1,724,943 | 535,416 |
| European Commission | 4,360,000 | 2,530,691 |

| Country / activity | EnDev 2 funding (EUR) | Disbursements |
|---|---|---|
| **EnDev 2 program** | **202,934,943** | **107,479,025** |
| | | |
| Programme management | 14,000,000 | 7,371,766 |
| | | |
| Benin, rural electrification | 7,160,000 | 1,655,036 |
| Benin, stoves | 4,000,000 | 2,090,490 |
| Burkina Faso | 3,500,000 | 2,353,885 |
| Burundi | 1,500,000 | 808,813 |
| Ethiopia | 15,467,000 | 10,516,369 |
| Ghana | 1,650,000 | 1,497,781 |
| Kenya | 7,800,000 | 5,872,487 |
| Liberia | 990,000 | 230,378 |
| Madagascar | 300,000 | 240,246 |
| Malawi | 500,000 | 225,482 |
| Mali | 3,000,000 | 287,118 |
| Mali old | 2,000,000 | 2,217,616 |
| Mozambique | 10,800,000 | 5,826,857 |
| Rwanda | 15,491,000 | 4,179,227 |
| Senegal | 10,870,000 | 9,829,302 |
| Tanzania | 2,041,000 | 96,120 |
| Uganda | 8,000,000 | 5,568,510 |
| EU West Africa | 1,990,000 | 1,259,365 |
| | | |
| Bangladesh | 14,064,000 | 8,699,052 |
| Cambodia | 2,000,000 | 533,501 |
| Indonesia, biogas | 1,150,000 | 522,514 |
| Indonesia, solar / hydropower | 11,960,000 | 8,144,183 |
| Nepal | 4,740,000 | 1,460,759 |
| Vietnam | 3,740,000 | 322,040 |
| | | |
| Bolivia | 11,400,000 | 8,297,784 |
| Honduras | 5,630,000 | 4,469,986 |
| Nicaragua | 5,640,000 | 3,964,505 |
| Peru | 11,350,000 | 8,451,235 |
| **Disbursements of projects on 31.12.2013 already approved under EnDev 1** | | |
| Mongolia | 495,000 | 486,618 |

# Annex 1: RBF Summary

## RBF for picoPV, Bangladesh

| RBF Key Performance Indicator (KPI) | Target | Achieved |
|---|---|---|
| number of beneficiaries (EnDev counting method) | 738,225 | - |
| EUR per beneficiary | 4.38 | - |
| t $CO_2$e avoided (over the lifetime of products sold during project) | 56,952 | - |
| EUR per t $CO_2$e avoided | 56.43 | - |
| private sector leverage ratio | 2.5 | - |
| jobs created | not quantified | - |
| enterprises created/upgraded | 20 | - |
| technologies deployed | 255,000 PicoPV systems (mix) | - |

**Progress on RBF in monitoring period**

Key components of the RBF facility include (i) design, development and implementation of the RBF financial product in cooperation with IDCOL; (ii) agreement on the mechanism about on-site verification of picoPV suppliers, end retailers and consumers; and (iii) multi-stakeholder coordination in the operation and analysis of the market-actor behaviour resulting from the introduction of the RBF financial product into the supply chain. The RBF incentives will only be provided upon the verified proof of approved picoPV sales.

Progress on the RBF has been slowed down by civil unrest preceding the general elections and the need to coordinate the EnDev RBF with IFC Lighting Africa activities and a picoPV programme financed from bilateral DFID funds. Aligning these programmes will help to maximise the impacts of the RBF programme.

The RBF operational principles and the methods for incentive valuation based on picoPV unit performance have been discussed with IDCOL. There are still some open questions regarding the size of the incentive and the exact modalities of the incentive scheme. Once these questions are clarified, contracting of IDCOL will be finalised.

**RBF learning points**

Intended learning outcomes for the RBF in Bangladesh are on a general level: (i) assessment of the effectiveness of the RBF to stimulate investments into the picoPV sector, (ii) the synergism between RBF and other cooperation methods. On a project level EnDev Bangladesh intends to learn about (i) the marketing and capacity building strategies of the suppliers; (ii) the use of financial incentives by retailers; and (iii) the relationship between incentive valuation based on energy service results and the increase in market share of products delivering higher energy service for the beneficiaries. These learning objectives are preliminary and might have to be adjusted according to the final setup of the programme with IDCOL.

**RBF impact indicators**

In addition to the EnDev outcome monitoring and the KPI, EnDev Bangladesh will monitor retail price developments for picoPV products, the build-up of an appropriated sales and service infrastructure in the rural areas and the average cost of delivering energy services to rural consumers.

The project aims at developing the market for high quality picoPV products. Therefore, the number of additional suppliers of EnDev and Lighting Africa-approved picoPV products will be another key impact indicator. These impact indicators are preliminary and might have to be adjusted according to the final setup of the programme with IDCOL.

## RBF for solar products promotion, Benin

| RBF Key Performance Indicator (KPI) | Target | Achieved |
|---|---|---|
| number of beneficiaries (EnDev counting method) | 343,415 | - |
| EUR per beneficiary | 8.91 | - |
| t $CO_2$e avoided (over the lifetime of products sold during project) | 215,000 | - |
| EUR per t $CO_2$e avoided | 14.23 | - |
| private sector leverage ratio | 3.2 | - |
| jobs created | not quantified | - |
| enterprises created/upgraded | 10 | - |
| technologies deployed | 441,282 picoPV<br>2,550 streetlights<br>262 solar pumps | - |

**Progress on RBF in monitoring period**

During the reporting period, EnDev Benin has focussed on elaborating an operations manual for the RBF programme. A baseline study has been carried out and documented. By the end of the reporting period, the project team in cooperation with EnDev HQ developed an appropriated contractual model to be used in the relations with the private sector participants in the programme. This took longer than expected, as for Benin special contract models had to be developed for direct interaction of GIZ with the private sector without involvement of a financial institution as RBF fund manager.

Further, EnDev Benin succeeded in reaching an agreement with ABERME, which is able to provide an import tax exemption for the solar products to be imported under the programme (picoPV, solar pumps, and solar streetlights).

The different RBF schemes are expected to enter the market during the first semester of 2014, starting with the picoPV component.

**RBF learning points**

The GIZ RBF programme is still in the preparatory phase. However, some experiences have been made in the Beninese market with solar RBF programmes by SNV. The local GIZ team is in close cooperation with SNV to benefit from these learnings. A key learning point in the programme will be how RBF works in direct interaction between GIZ and private sector companies, as due to the lack of a suitable financial institution the fund management and award of RBF contracts to private sector participants will be carried out directly by GIZ.

The street lighting component of the RBF in Benin is supposed to also yield learning points regarding the application of RBF in a market involving public sector clients.

**RBF impact indicators**

Given the early stages of implementation, the set of impact indicators is still to be finalised.

## RBF for improved cookstoves, Ethiopia

| RBF Key Performance Indicator (KPI) | Target | Achieved |
|---|---|---|
| number of beneficiaries (EnDev counting method) | 275,000 | - |
| EUR per beneficiary | 5.61 | - |
| t $CO_2$e avoided (over the lifetime of products sold during project) | 500,000 | - |
| EUR per t $CO_2$e avoided | 3,08 | - |
| private sector leverage ratio | 1.3 | - |
| jobs created | 64 | - |
| enterprises created/upgraded | 16 | - |
| technologies deployed | 103,000 MIRT stoves, 103,000 TIKIKIL stoves | - |

**Progress on RBF in monitoring period**

In order to improve understanding of the market and gather additional information needed for proper price setting of the incentive EnDev Ethiopia carried out a baseline study during the reporting period. Detailed baseline data for representative Woredas (Districts) are now available. In parallel, local consultants were recruited to assist in detailed RBF design and preparatory work. Further, the project assessed the capacity / readiness of relevant partners (stove producers, micro-finance institutions, regional and district-level energy departments). The RBF incentives are expected to enter the market in the first semester of 2014.

**RBF learning points**

The detailed preparation work has slightly delayed the publication of the RBF incentive, but yielded important findings for the success of the RBF. The following areas of concern have been identified and will be followed up during implementation:

- Limited / no experiences of financial institutions (FIs) in managing RBF type of projects
- Limited number of FIs
- Willingness to pay and affordability of stoves by rural households not assured
- Capacity (both managerial and technical) of the ICS suppliers (private sectors) not yet known
- Poor infrastructure conditions for access to reach remote rural households

**RBF impact indicators**

Given the early stages of implementation, the exact impact indicators will only be outlined in the next progress report.

## RBF for solar lighting, Rwanda

| RBF Key Performance Indicator (KPI) | Target | Achieved |
|---|---|---|
| number of beneficiaries (EnDev counting method) | 880,000 | - |
| EUR per beneficiary | 3.86 | - |
| t $CO_2$e avoided (over the lifetime of products sold during project) | 64,800 | - |
| EUR per t $CO_2$e avoided | 52.47 | - |
| private sector leverage ratio | 3 | - |
| jobs created | 50 | - |
| enterprises created/upgraded | 10 | - |
| technologies deployed | 160,000 task lights, 192,000 room lights | - |

**Progress on RBF in monitoring period**

EnDev Rwanda is about to start the implementation of the two result-based financing projects (Village grids and Solar lighting). In a two-step process, a Rwandese bank is being selected as implementer of the project. An “Operations Manual” that outlines all steps and procedures, as well as the tools to be used during implementation of the programme has been drafted and made available to pre-qualified banks that submitted an expression of interest. Hence, standard internal policies and procedures for the main stakeholders are established. In December 2013, three technical and financial project proposals have been received from the prequalified banks. EnDev Rwanda will negotiate a grant agreement with the successful bank. A project manager will be hired on a consultancy basis to oversee project implementation. The RBF is expected to enter the market in the 1st half of 2014.

**RBF learning points**

To assess the effectiveness of RBF as an instrument, and identify lessons learned for future application, EnDev Rwanda will monitor whether accompanying capacity development measures for the different actors in the private sector and financial sector are necessary for this RBF to be successful. In addition, the project aims to learn lessons on what should be taken into consideration when a bank is implementing a project that involves activities beyond standard banking operations.

**RBF impact indicators**

To monitor the impact of RBF on market development and consumers, EnDev Rwanda will monitor indicators that capture financial benefits for end-users, the development of end-user sales prices for picoPV appliances as well as private sector investments in rural distribution systems, training for distribution agents and rural marketing triggered by the RBF intervention.

## RBF for renewable energy village mini-grids, Rwanda

| RBF Key Performance Indicator (KPI) | Target | Achieved |
|---|---|---|
| number of beneficiaries (EnDev counting method) | 18,750 | - |
| EUR per beneficiary | 100.85 | - |
| t $CO_2$e avoided (over the lifetime of products sold during project) | 11,105 | - |
| EUR per t $CO_2$e avoided | 170.28 | - |
| private sector leverage ratio | 2 | - |
| jobs created | 90 | - |
| enterprises created/upgraded | 16 | - |
| technologies deployed | 25 pico-hydro mini-grids, 10 micro-hydro mini-grids | - |

**Progress on RBF in monitoring period**

See RBF for solar lighting

**RBF learning points**

To assess the effectiveness of RBF as an instrument, and identify lessons learned for future application, EnDev Rwanda will monitor whether RBF works for infrastructure projects with higher up-front capital expenditures and longer lead times. In addition, EnDev Rwanda will observe whether accompanying capacity development measures are necessary for private sector actors to benefit fully from the incentives and thus for this RBF to be successful. On the financial sector end, it has already been observed that the financial institution involved in the implementation sees itself unable to fulfil the specific monitoring requirements of a mini grid project. Thus, the GIZ team will have a stronger role in monitoring and verification of the hydro RBF, compared to the solar lighting RBF scheme.

**RBF impact indicators**

To assess the impact of RBF on market development and consumers, EnDev Rwanda will monitor indicators that capture financial benefits for end-users through cost savings compared to baseline technologies (kerosene, diesel) and cost reductions for household connections. On a project level, the development of electrification costs as compared to the national electricity access roll-out programme will be monitored.

## RBF for solar picoPV in the Lake Zone, Tanzania

| RBF Key Performance Indicator (KPI) | Target | Achieved |
|---|---|---|
| number of beneficiaries (EnDev counting method) | 181,970 | - |
| EUR per beneficiary | 8.47 | - |
| t $CO_2$e avoided (over the lifetime of products sold during project) | 57,000 | - |
| EUR per t $CO_2$e avoided | 27.04 | - |
| private sector leverage ratio | 2.7 | - |
| jobs created | 90 | - |
| enterprises created/upgraded | 56 | - |
| technologies deployed | 115,799 | - |

**Progress on RBF in monitoring period**

Key components of the RBF facility include (i) design, development and implementation of the RBF financial product in cooperation with the hosting financial institution; (ii) coordination of third party on-site verification of picoPV suppliers, end retailers and consumers; and (iii) multi-stakeholder coordination in the operation and analysis of the market-actor behaviour, resulting from the introduction of the RBF financial product into the supply chain. The RBF incentives will only be provided upon the verified proof of approved picoPV sales to rural consumers in the Lake Zone and paid in instalments to the private sector in the form of a product bonus to end retailers and a capital bonus to suppliers.

Upon the finalisation of contracting in mid-October 2013 that resolved important legal questions relating to RBF modalities, the project has moved in the initial phases of implementation. The RBF operational guideline and the methods for incentive valuation based on picoPV unit performance have now been finalised. The contracting of the hosting financial institution is being finalised. EnDev Tanzania will start the first public posting in February 2014, with supplier applications to the RBF fund with subsequent selection and contracting of the companies due in March and April 2014. The goal of the RBF facility is for companies to begin recording valid sales for picoPV in the Lake Zone beginning with May 2014, with payment flows to the private sector beginning in July or August 2014. During these stages of private sector induction to the RBF fund, the programme will also (i) support the partnering TIB Development Bank to finalise documentation formats and processes necessary for functioning of the RBF; and (ii) initiate selection and training of the parties who will conduct the verification.

**RBF learning points**

Learning outcomes initially identified for the RBF facility are related to: (i) information generated relative to marketing and capacity building strategies applied by suppliers; (ii) retailer use of bonus products provided in the incentive scheme; and (iii) the relationship between incentive valuation based on energy service results and the increase in market share of products delivering higher energy service for the beneficiaries.

**RBF impact indicators**

In order to assess the impact of the RBF scheme, EnDev Tanzania will monitor the average cost of delivering energy services to rural consumers. The project aims at developing the market for high quality picoPV products. Therefore, the number of additional suppliers of EnDev and Lighting Africa-approved picoPV products will be another key impact indicator.

## RBF for domestic biogas, Vietnam

| RBF Key Performance Indicator (KPI) | Target | Achieved |
|---|---|---|
| number of beneficiaries (EnDev counting method) | 275,000 | 39,165 |
| EUR per beneficiary | 13.60 | 8.22 |
| t $CO_2$e avoided (over the lifetime of products sold during project) | 4,469,000 | 413,582[33] |
| EUR per t $CO_2$e avoided | 0.84 | 0.78 |
| private sector leverage ratio | 7 | 7.3 |
| jobs created | 960 | 0 |
| enterprises created/upgraded | 160 | 0 |
| technologies deployed | 55,000 | 7,833 |

**Progress on RBF in monitoring period**

Figures given have been achieved through continuation of the (results-based) incentive scheme that was in place before the start of the EnDev-RBF project. This incentive scheme is phased out and replaced by a more market oriented RBF incentive on a per province basis. The call for biogas companies in the first pilot provinces to sign up for the RBF mechanism will be published in March 2014, with the first RBF incentives being paid in the first semester.

**RBF learning points**

Information regarding the RBF learning points will be assessed by a baseline study (before training) and by a survey of masons during the RBF pilot. Observations on the learning topics will be continuously reported: (a) Biogas enterprises operating in the pilot provinces are required to obtain a bank account in order for the PMU to transfer the RBF incentive. Hereby, biogas enterprises become familiarised with formal banking and monetary systems, thus creating access to and knowledge about banking. Will this assist the BMEs in professionalising their business? (b) The biogas enterprises will receive an RBF incentive. What will they do with it? Will they transfer it to the end user as a discount, will they invest the money in the enterprise or will the incentive be used for different purposes? (c) For the pilot phase, both provinces with high and low digester sales were chosen. Low-performing provinces also have generally lower political support. In this case, market actors could be more active in catalysing development in the biogas sector. Will RBF be relatively more effective in low performing provinces? (d) In the pilot provinces, the end user investment subsidy is eliminated and replaced by the RBF incentive paid to the private sector companies. Will the RBF incentive be an effective mechanism to phase out end user subsidies and/or increase the BMEs' responsibility? (e) Will RBF impact the intensity of marketing and sales efforts by biogas enterprises? (f) Will increased awareness about affordable loans result in increased adoption of biogas technology?

**RBF impact indicators**

The project will study a number of impact topics and indicators: (a) Will RBF have a long term impact on end user prices? (b) Will RBF accelerate market development for biogas? (c) Does professionalization of biogas enterprises result in increased application of biogas for non-cooking and lighting purposes?

[33] Please note that these figures are for information purposes only. They are not included in overall EnDev achievements, as in this project certificates are generated and sold on the voluntary market.

# Abbreviations

| | |
|---|---|
| ABERME | Agence Béninoise d'Electrification Rurale et de Maîtrise d'Énergie, Benin |
| ADA | Appui au développement autonome |
| ADDAC | Asociación para la Diversificación y el Desarrollo Agrícola Comunal, Nicaragua |
| ADEL | Agência de Desenvolvimento Econômico Local, Mozambique |
| ADES | Association pour le Développement de l'Energie Solaire, Switzerland |
| ADLP | GIZ Decentralisation and Poverty Reduction Programme, Burundi |
| AEEP | Africa-EU Energy Partnership |
| AEME | Agence pour l'Economie et la Maîtrise de l'Energie, Senegal |
| AEPC | Alternative Energy Promotion Centre, Nepal |
| AfDB | African Development Bank |
| AGROIDEAS | Program for Competitiveness from the Ministry of Agriculture, Peru |
| AKSM | Associação Kuaedza Simucai Manica, NGO in Mozambique |
| AMADER | Agence Malienne pour le Developpement de l'Energie Domestique et de l´Electrification Rurale, Mali |
| AMES-M | Access to Modern Energy Services Mozambique |
| ANER | Agence Nationale des Energies Renouvelables, Senegal |
| APCI | Peruvian Agency for International Cooperation |
| ASDDG | Action Sud Développement Durable Genève, Madagascar |
| ASER | Direction de l'Energie, Agence Sénégalaise de l'Electrification Rurale, Senegalese Rural Electrification Agency |
| BCCs | Biogas Construction Companies |
| BCSs | Battery Charging Stations |
| BEST | Biomass Energy Strategy |
| BIRU | BIogas RUma, Indonesian for Household Biogas |
| BME | biogas mason enterprise |
| BMZ | the German Federal Ministry for Economic Cooperation and Development |
| BReIDGE | SMS-gateway, Indonesia |
| CATALYST | Catalyze Accelerated Agricultural Intensification for Social and Environmental Stability of the IFDC in Burundi, Rwanda, and the Democratic Republic of Congo |
| CB | Chitetezo Mbaula, Malawi |
| CCAK | Clean Cookstoves Association of Kenya |
| CIF | Climate Investment Funds |
| COOPI | Cooperazione Internazionale, Italy |
| CRED | Community Rural Electrification Department, Nepal |
| CREE | Community Rural Electrification Entities |
| DEF | double energy factor |
| DETA | GIZ Development Oriented Emergency and Transitional Aid, 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 |
| DGHER | General Directorate of Water and Rural Energies, Burundi |
| DIPREME | Direcções Provinciais de Energia, Mozambique |
| DNCT | Direction Nationale de Collectivites Territoriales, Mali |
| DREID | Database for Renewable Energy Indonesia |
| ECHD | Excellence Centre Hydro Department, Mozambique |
| EdM | Electricidade de Moçambique |
| EEA | Ethiopian Energy Agency |
| EHPS | Ethiopian Hydro Power Society |
| ELCOM | ELectrification COMmunale, Mali |
| ENATREL | Empresa Nacional de Transporte de Energía Electrica, Nicaragua |
| EnDev | Energising Development programme |
| ENEE | Empresa Nacional de Energía Eléctrica, Honduras |
| EPA | Environmental Protection Authority, Ethiopia |

| | |
|---|---|
| EPP | Emergency Power Program, Liberia |
| EREP | ECOWAS Renewable Energy Programme |
| ERSEN | Électrification rurale Sénégal |
| ERT | Energy for Rural Transformation II Programme, Uganda, financed by World Bank |
| ESP | Enterprise Service Providers |
| EU-ACP EF | EU Africa-Caribbean-Pacific Energy facility |
| EUEI-PDF | European Union Energy Initiative-Partnership Dialogue Facility |
| EWSA | Energy, Water and Sanitation Authority, Rwanda |
| FABEN | Foyers Améliorés au Benin |
| FACET | Finance for Access to Clean Energy Technologies, South and South East Asia |
| FAFASO | Foyers Améliorés au Burkina Faso |
| FASEN | Foyers Améliorés au Sénégal |
| FOCAEP | Central American Fund for Access to Sustainable Energy and Poverty Reduction |
| FODIEN | Electricity Industry Development Fund, Nicaragua |
| FONER | Project for the improvement of the rural grid through a grant fund, Peru |
| FOPRONH | Formación Profesional No Formal en Honduras |
| FSD | Financial Sector Development |
| FSTE | Fond de Solidarité des Travailleurs de l'Enseignement, Burundi |
| FUNAE | Fundo de Energia, Mozambique |
| GACC | Global Alliance for Clean Cookstoves |
| GIZ | Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH |
| GOGLA | Global Off-Grid Lighting Association |
| GSDI | Ghana Skills Development Initiative |
| GTF | Global Tracking Framework of the SE4ALL initiative |
| HH | households |
| HIVOS | Humanistisch Instituut voor Ontwikkelingssamenwerking |
| ICF | Instituto de Conservación y Desarrollo Forestal, Honduras |
| ICS | improved cookstoves |
| IDB | Inter-American Development Bank |
| IDBP | Indonesia Domestic Biogas Programme |
| IDCOL | Infrastructure Development Company Limited, Bangladesh |
| IFAD | International Fund for Agricultural Development |
| IFDC | International Fertilizer Development Center |
| IIM | Instituto Industrial de Maputo, Mozambique |
| IPP | independent power producers |
| IRSAT | Institut de Recherche en Sciences Appliquées et de Technologie |
| IRTICP | Improved Resilience Through Improved Cooking Practices |
| ISAK | Improved Stove Association Kenya |
| ISO | International Organization of Standardization |
| ITF | EU-Africa Infrastructure Trust Fund |
| IWME | improve traditional water mills |
| KIRDI | Kenya Industrial Research and Development Institute |
| KPI | key performance indicator |
| KUKM | Kementerian Koperasi dan Usaha Kecil dan Menengah, Indonesia (Indonesian Cooperative for micro, small and medium enterprises) |
| LDC | Least Developed Country |
| LESEP | Liberia Electricity Enhancement Project |
| LIFSAP | World Bank: Livestock Competitiveness and Food Safety Project |
| LME | last mile entrepreneur |
| 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, Mali |
| MDG | Millennium Development Goal |
| MEI | MicroEnergy International |
| MEM | Ministry of Energy and Mines, Benin |

| | |
|---|---|
| MEM | Ministry of Energy and Mines, Nicaragua |
| MEM | Ministère en charge de l'Energie, Senegal |
| MEMD | Ministry of Energy and Mineral Development, Uganda |
| MEMR | Ministry of Energy and Mineral Resources, Indonesia |
| MERPMEDER | Ministre de l'Energie, des Recherches Pétrolières et Minières, de l'Eau et du Développement des Energies Renouvelables; 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 hydro power |
| MHPP | micro hydropower plant |
| MININFRA | Ministry of Infrastructure, Rwanda |
| MNP | Madagascar National Parks |
| MoE&P | Ministry of Energy and Petroleum, Kenya |
| MoEF | Ministry of Environment and Forests, Bangladesh |
| MoHA | Ministry of Home Affairs, Indonesia |
| MoSTE | Ministry of Science, Technology and Environment, Nepal |
| MoU | Memorandum of Understanding |
| MoWIE | Ministry of Water, Irrigation and Energy, Ethiopia |
| NACEUN | National Association of Community Electricity Users Nepal |
| NBP | National Biodigester Programme, Cambodia |
| NBSSI | National Board for Small Scale Industries, Ghana |
| NEA | Nepal Electricity Authority |
| NEEP | Nepal Energy Efficiency Programme |
| NREEC | Directorate General for New and Renewable Energy and Energy Conservation, Indonesia |
| NREP | National Rural Electrification Programme, Nepal |
| NRREP | National Rural and Renewable Energy Programme, Nepal |
| PACT | Programme Promotion of Local Government, Mali |
| PADEE | Project for Agriculture Development and Economic Empowerment, Cambodia |
| PASES | Projet d'accès aux services électriques des localités de petite taille dans la région de Sédhiou, Senegal |
| PDP | GIZ Renewable Energy Project Development Programme, Liberia |
| PEB | Education Programme |
| PEN | People and Energy Network, Ethiopia |
| PERACOD | Promotion of Renewable Energies, Rural Electrification and Sustainable Supply of Household fuels |
| PEVD | Program Electricity to live with dignity, Bolivia |
| picoPV | pico photo voltaic |
| PNESER | Programa Nacional de Electrificación Sostenible y Energías Renovables, Nicaragua |
| PNPM MP | Program Nasional Pemberdayaan Masyarakat Mandiri Perdesaan, Indonesia (National Program for Community Empowerment – Rural) |
| PPFD | BMZ: Decentralisation Programme, Mozambique |
| PRDP | Peace, Recovery and Development Plan, Uganda |
| ProAgri | Promotion de l'Agriculture (GIZ) |
| PROAGRO | Programa de Desarrollo Agropecuario Sustentable (BMZ), Bolivia |
| ProCEAO | Programme pour l'Energie de Cuisson économique en Afrique de l'Ouest |
| PSED | BMZ Programme for Sustainable Economic Development, Ghana |
| PSP Hydro | Private Sector Participation in Micro-Hydropower Supply for Rural Development, Rwanda |
| PU | productive use of energy |
| PVTMA | photovoltaic targeted market approach |
| QC | quality control |

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| QSEAP | Asian Development Bank: Quality and Safety Enhancement of Agricultural Products and Biogas Development Project |
| RBF | Results-Based Financing |
| RE-Map | interactive digital renewable energy map, Indonesia |
| REA | Rural Electrification Agency, Uganda |
| RECP | Africa-EU Renewable Energy Cooperation Programme |
| REFIT | renewable energy feed-in tariff |
| RFP | Red Fire Pot |
| RRA | Renewables Readiness Assessment of IRENA |
| RTF | Rural Technology Facilities |
| RVO | Rijksdienst voor Ondernemend Nederland |
| RWI | Rheinisch-Westfälisches Institut für Wirtschaftsforschung |
| SAF | sustainability adjustment factor |
| SBEE | Société Béninoise de l'énergie électrique, Benin |
| SCP | Strategic Climate Fund |
| SE4All | Sustainable Energy for All initiative |
| SED | Renewable Energy and Energy Efficiency / Sustainable Energy for Development (BMZ), Bangladesh |
| SEDA-E | Solar Energy Development Association of Ethiopia |
| SHS | solar home system |
| SI | social institution |
| SME | small and medium enterprise |
| SMSS | Solar-Multi-Service-Station |
| SNV | Stichting Nederlandse Vrijwilligers |
| SREP | Scaling Up Renewable Energy Programme |
| SSHS | small solar home system |
| SWH | solar water heater |
| TEA | Talk Energy Ahead, Ethiopia |
| ToT | Trainers of Trainers |
| TSAEE | Tanzania Society of Agricultural Education and Extension |
| TVET | Technical Vocational Educational and Training Units, Ethiopia |
| UGM-PSE | University Gajah Mada Centre of Energy, Indonesia |
| UNICEF | United Nations Children's Fund |
| VBA | Vietnam Biogas Association |
| VDG | Vulnerability Group Development, Bangladesh |
| VMEEA | Vice Ministry for Electricity and Renewable Energy, Bolivia |
| WGF | windfall gain factor |
| WHO | World Health Organisation |