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on

Energising Development – Phase 2

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A. EnDev in 2013 – new trends and challenges

From a bi-party to an international partnership

In the last one and a half years, EnDev developed from a Dutch-German Partnership to a multi-donor programme supported by Australia, Germany, the Netherlands, Norway, and the United Kingdom, with additional funding from the European Union and Ireland. The accession of several donors has led to a significant increase of the overall objectives and the budget of the program. Thus, the total budget of the second phase of EnDev has jumped from EUR 78 million to currently EUR 173.9 million. Based on the benchmark of EUR 20 per person, this translates to a new target of 8.7 million people that are expected to gain access to modern energy services through EnDev 2, and 13.71 million people for the two phases combined.

The increase of the overall budget allows to significantly up-scale ongoing EnDev country projects for further developing markets for energy access products and services. However, there is also the risk that additional funds cannot sufficiently accelerate market development, as the absorption capacity of all involved stakeholders is limited. Additional outcomes may fall short in comparison to the increased funding. As a result, some of the main features of the EnDev approach such as strong outcome orientation, high cost efficiency, and strong focus on sustainability are at risk of coming under pressure.

Total budget in EUR		
EnDev 1		
DGIS	60.0 million	
BMZ	unspecified	
EnDev 2		
DGIS	68.0 million	39.1%
BMZ	40.0 million	23.0%
DFID	37.0 million	21.3%
AusAid	15.8 million	9.1%
MFA-NO	8.2 million	4.7%
EU-EF	4.4 million	2.5%
Irish Aid	0.5 million	0.3%
Subtotal	**173.9 million**	**100%**
Total:	**233.9 million**	

To keep up EnDev's performance based approach, it is foreseen to scale up country projects only if there is a real chance for market development acceleration, and if cost efficiency and sustainability are not affected. In parallel it is planned to start activities in new countries where chances to develop successful energy access projects are high.

An additional risk mitigation and diversification strategy could be to open EnDev to a limited number of other implementing organisations, preferably those related to contributing donors. Up to now, EnDev country activities have been implemented mainly by GIZ. This worked well, as GIZ has a well-functioning implementation infrastructure of projects and staff in many partner countries. However, relying only on GIZ structure prevents using opportunities the broad range of structures and qualified staff that exist outside GIZ. Ignoring this cooperation potential is not advisable, especially as the EnDev programme has achieved high visibility in international discussions. The participation of additional donors provides a timely opportunity to consolidate and actively expand EnDev's approach through the development of implementation partnerships with organisations that are already close to EnDev's approach and can either take up EnDev's implementation philosophy in their further work, or broaden EnDev's range of implementation instruments. Moreover, cooperation with suitable partners might improve EnDev's implementation efficiency by making use of their existing structures or expertise in both geographical and tech-

Main features of the EnDev approach:

- Strong outcome orientation
- High cost efficiency, and ability to mobilize local economic resources
- Strong focus on -proven- sustainability and impact
- Using/strengthening local capacities
- Fast and flexible scale up of successful projects
- Wide range of flexible tools and instruments
- Stringent and reliable (yet lean) monitoring
- High accountability of results

nical / conceptual areas where EnDev otherwise would have to design and build these structures from the start. The EnDev programme could ideally comprise maximum 4 or 5 agencies in order to keep it manageable. GIZ would continue to have the overall responsibility for the implementation of the programme including planning, reporting and financial management. As a first step in this direction some of the country activities presented in this Annual Planning document will be implemented by other organisations, but coordinated by GIZ and administered through GIZ systems.

Implementation of a Result Based Financing (RBF) facility

In July 2012 BMZ and DFID signed an arrangement on delegated cooperation, which serves as the basis for DFID joining EnDev as the fifth donor represented in the governing board. Right after the signature of the delegated cooperation arrangement and in only six weeks between early July and mid-August, EnDev country projects and potential implementation partners (among them SNV, Practical Action and GVEP) have succeeded in developing 32 concept notes for possible RBF interventions in 16 countries and one regional approach. The 32 concept notes have been discussed and assessed by an evaluation committee consisting of four internal evaluators from DFID, GIZ and NLAgency as well as two external evaluators. The assessment was based on a set of criteria communicated to the proponents before the development of the concept notes. These criteria covered a wide range of aspects, including e.g. fit with RBF concept, innovativeness of approaches, alignment with partner country strategies, cost / outcome relation, and interest of the private sector to invest. Based on these criteria, the evaluation committee selected 12 concept notes to be developed further into full RBF project proposals, some of them with adjusted budgets. (Table 1)

Tab. 1: RBF concept notes selected for development of full proposals

Country	Title of Concept Note	RBF budget	Comments
Benin	RBF for lifting up 4 offgrid PV market segments to the next level	3,000,000 €	budget reduced
Ethiopia	Cooking stoves in Ethiopia	1,500,000 €	budget reduced
Malawi	'Rocket' Chicken Brooders in Malawi	1,571,405 €	
Mozambique	Pico PV in Mozambique	1,108,100 €	project has meanwhile been withdrawn by Mozambique
Rwanda	Market Creation for LED Lighting	3,039,655 €	
Rwanda	Market Creation for Renewable Energy Mini Grids	2,986,820 €	
Rwanda	Marketing Support for the Improved Cookstoves in Rwanda	1,500,000 €	budget reduced
Tanzania	Rural Market Development for solar pico PV, Lake Zone Tanzania	1,185,000 €	
Bangladesh	Pico PV and SSHS in Bangladesh	3,000,000 €	combination of two concepts with reduced budget
Indonesia	Kalimantan Micro-hydro Incentive Scheme (KALMIS)	1,910,000 €	
Vietnam	Creating a Market Driven Biogas Sector in Vietnam	3,455,000 €	
Peru	Solar Water Heaters in Peru	1,100,000 €	

Some of the concept notes have been discarded for the RBF facility due to their lack of fit with the RBF concept, but are still good project proposals in terms of the "standard" EnDev approach. These have been included in this Annual Planning 2013 with slightly changed approaches. They will be financed with non-DFID EnDev funds if this Annual Planning is approved by the governing board.

A number of experienced consultants are currently assisting country projects in developing full proposals for the selected concept notes. It is expected to have all full proposals ready until the end of December 2012. They will then be reviewed by an evaluation committee in January 2013, similar to the process carried out for the concept notes and according to a transparent evaluation format. The selected projects will be put forward to DFID for signing off in February / March 2013. The remaining list of EnDev RBFs will feed into up-scaling proposals and proposals for new country measures, to be submitted to the Governing Board in an Annual Planning 2013 Update. This Annual Planning Update will follow the normal EnDev process, i.e. all governing board members will have the chance to discuss it and, if necessary, raise objections.

Lessons learnt from concept note phase

During the preparation of the concept notes it became clear that RBF is a very challenging approach that needs to be carefully planned and implemented to avoid unwanted impacts. Several issues are currently being discussed between DFID, the EnDev management team and the projects.

- The single most challenging item is DFID's interest that 80% of the UK contribution to EnDev should go into energy access markets as financial incentives. The remaining 20% should cover all other costs, including personnel costs, capacity development measures, monitoring and evaluation, fees charged by financial institutions for administering the RBF scheme and overheads. While it is desirable and agreed by all parties to minimise management, administrative costs and overheads, there is a limit when lack of resources for these items will make it impossible to implement the RBF project with the quality known from EnDev and requested from DFID. In some cases, RBF schemes would be combined with existing projects having personnel in place and providing the necessary capacity development in the respective energy access sub-sectors. In other cases cooperation with TA activities from other organisations has to be found, or if the need for capacity building is only very low (as might be the case in more advanced markets) it can be integrated as a commercial cost for the entrepreneurs into the RBF incentive. The full proposal phase will assess what options are available and realistic.
- 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 e.g. 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 will not benefit from the RBF.
- There is a trade-off between creating intellectually interesting RBF applications and selecting projects that have a high probability of success. It will be necessary to agree on an acceptable middle ground between DFID's scientific interest and EnDev's assignment to achieve results for a large target group.
- It is the centre piece of RBF that the private sector (including the financial sector) bears the full risk of dissemination of energy access solutions. Pure RBF discards the possibility to provide concessionary up-front finance. Only few market actors and financial institutions will be able or willing to come up with the necessary pre-financing on their own. This creates the risk of the RBF making already strong firms and financial institutions stronger, and eventually supports the creating of monopolies and oligopolies. Such effect could be avoided by a careful selection of participating firms and financial institutions. These new actors, however, need to be capacitated to join the

market and benefit from the RBF incentive. This however, seriously conflicts with the goal to minimize costs for capacity development (see above).

- The combination of a minimum size for the RBF of EUR 1 million, combined with an obligation of 80% of costs going into subsidies and a short time frame of four years creates a serious risk of over-subsidising nascent markets. This would lead to destruction rather than the development of markets for energy access solutions. It will be necessary to carefully assess the absorption capacity in the current phase of proposal development. This is especially the case for cookstove projects, where out of past experience of development partners, EnDev is rather sceptical on the use of subsidies as a market development tool. This might result in the recommendation to refrain from some RBFs in order to avoid market distortion.

The RBF facility of EnDev can become an interesting additional instrument for the development of energy service markets. However, it is recommended to implement RBF with care and to use it -if possible- complementary to other instruments currently applied by EnDev.

International discussions about access definitions and criteria

EnDev is increasingly being recognized internationally as one of the most comprehensive and successful energy access programmes of today. As a result of this recognition, EnDev has become a major player in international initiatives and discussions about access to energy such as the UN Secretary General's SE4All.

Among stakeholders of the SE4All initiative there is a tendency to replace the presently often used binary definition(s) of access to electricity by a multi-tier system to describe different levels of access to electricity; details of such a tiered description are still under discussion. EnDev has already developed such a system consisting of the five levels: minimum, partial, basic, advanced and full access. In the system access is defined in terms of services, for which both "energy" and a device turning the energy into a useful service are required. As it's often difficult to directly monitor a service access can be claimed by demonstrating access to the device and the required energy. Alternatively again, and assuming there's a more or less logical sequence in which services are used as based on needs, access can be claimed on the grounds of a certain electricity consumption.

The current state of development is summarised in the table below, where for each of the five tiers the service package is indicated as well as the corresponding electricity consumption, the typical delivery system and the number of people that can be counted per household. Thereby a first attempt is also made to incorporate efficiency, particularly of lamps, in the scheme by differentiating the amount of electricity required per tier, considering that for 'enough light' far less electricity is required if e.g. LEDs are used instead of incandescent bulbs.

different access levels for electricity				
terminology	**service package**	**kWh pppa**	**typical system**	**counted people**
full	all you want	1,000	grid	5
advanced	basic + TV, fan, video + productive use	100	minigrid	5
basic	light, telephone, radio / TV	10/20	SHS or SSHS	1-5
partial	less or only light, radio, TV, phone	3/6	rechargeable battery + charging facility	2/3
minimum	even less light	1	simple lantern	1/3

EnDev also tried to develop a tier system for cooking technologies and actively contributed to the International Workshop Agreement (IWA) of the Global Alliance for Clean Cook Stoves in February 2012. Four dimensions have been defined to measure the quality of cookstoves: **fuel use, emissions, indoor air quality and safety**. For each dimension, the methodology for the assessment and a **5-tier rating** ranging from 0 = "3-stone fire" to 4 = "aspirational target" have been tentatively defined. It has been agreed to have no overall rating summarizing all four dimensions due to the versatility of situations in which these stoves are used.

EnDev has discussed possibilities how the IWA results could be applied for the definition of "access to modern cooking energy". Some approaches have been developed, both for relative (comparing IWA baseline stove results with IWA results of ICS) as well as absolute criteria (minimum standard or quality levels of access "minimum to full"). However, it is recommended to postpone this decision for several reasons until at least the end of 2013.

1. **The character of the IWA outcomes is still tentative.** The use of a Water Boiling Test (WBT) in a USA-based Laboratory which is the base for assessing cooking efficiency is most likely not reflecting well enough the complex cooking system (fuel, stove, user behaviour, cooking environment), for which local stoves are developed and used. In addition customers in developing countries quite often prefer stoves that cook fast and are cheap. Fuel efficiency, emissions, indoor air quality and safety are surely important dimensions for stove quality. However, if there is no benchmarking for speed of cooking and cost of stove, the application of IWA for stove ranking may lead to the development of very expensive and slow cooking stoves which will not find a sustainable market in LDCs.
2. **Current lab-capacities are prohibitive for a comprehensive application of IWA.** Currently only laboratories in industrialised countries would be able to carry out all necessary tests. If EnDev contracted these laboratories to test all different stoves promoted in the twelve different country programmes, it would take more than a year and would be prohibitively expensive. If different stove sizes (for small, medium and large families) are tested separately, this would multiply duration and costs.

Given the above, the application of IWA at this point of time would assume a lot of resources and would delay decisions for scaling-up which are crucial for the success of the current EnDev obligations. At the same time, there are still a number of important questions to be answered to ensure that the IWA approach is leading towards the development of stoves bringing the necessary improvements for the EnDev target groups. Once these questions are answered, and the capacities for testing are increased, it will be useful to reconsider the different approaches for the application of IWA on EnDev. Therefore, EnDev will not (yet) substitute its current definition of "access to modern energy for cooking" (=40% reduction of specific fuel consumption). However, if this reduction is only between 30-40%, significant improvements on emissions (CO/PM) or safety can be considered.

EnDev will increase its knowledge on the IWA methodology through collaboration with the Aprovecho Research Center (ARC) in 2012/13. EnDev will participate in Aprovecho Stovecamp on IWA testing, carry out IWA testing with selected stoves, support the development of national and regional testing capacities and compare IWA stove testing results with results in regional testing centres to assess the impact of fuel and user behaviour on test results (2013/14).

EnDev will encourage its country programmes to use emission testing facilities to improve the quality of their stoves (technology development). EnDev will promote the application of the safety protocol in all its ICS country programmes in 2013. For stoves with tier ranking below 2, EnDev will request explanation from the country programmes and offer support for the improvement of the technology if required.

EnDev will continue engaging in the international debate on the IWA methodology and access definition, using its strong link to the users as a reference.

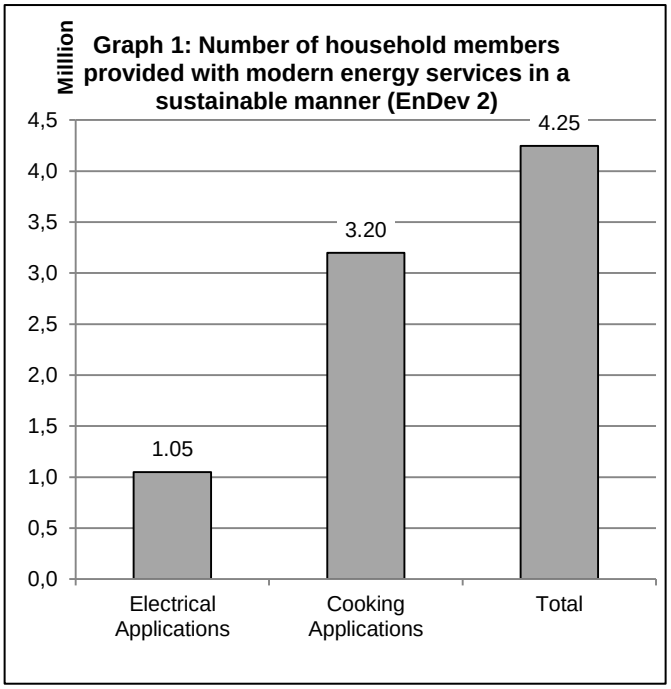
B. Overview on current status of the EnDev 2 programme

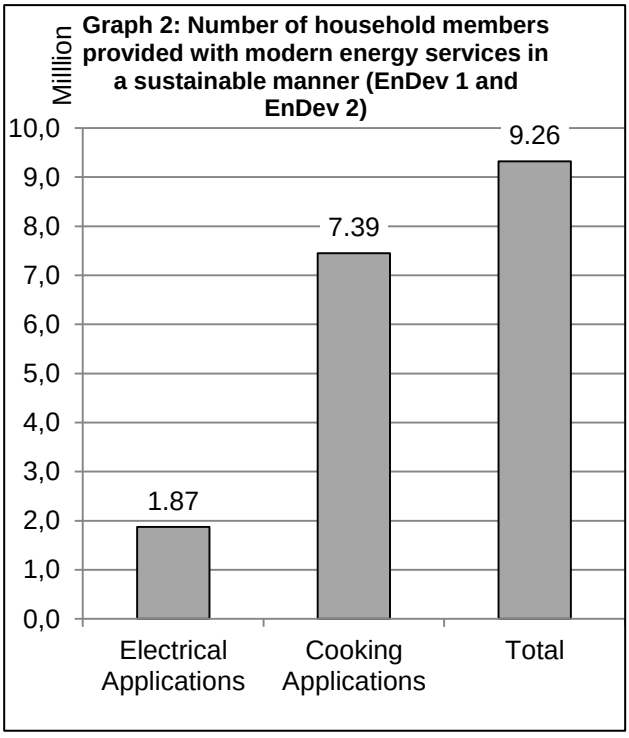
In 2012, the EnDev Partnership comprised 20 activities in 19 different countries. The focus of the programme is on African countries. Around 58% of the committed EnDev 2 funds are currently allocated to Africa.

Until June 2012, EnDev 2 facilitated sustainable access to modern energy services and technologies for about **4.25 million** people. This is either done with electricity by connecting households to the central grid, a minigrid powered by hydropower, through photovoltaic systems or with improved cooking technologies, such as improved firewood and charcoal stoves or biogas plants (Graph 1). In addition, 4,501 social institutions gained access to improved cooking energy or electricity, or other modern energy carriers and 11,718 small and medium enterprises now have access to a modern form of energy for productive use.

These figures take into account:

- a "sustainability adjustment factor", which takes into account that the access provided to modern energy technologies is not sustainable in all cases
- a "windfall gain factor", considering that some households supported by EnDev would have gained access to modern energy services anyway even without support
- a "double energy factor", which accounts for households and social institutions which received an improved cookstove or other modern cooking energy technologies but already had access to electricity.





When looking at the overall EnDev programme, starting from phase one in 2005 up to June 2012 in phase two, the total number of people, having gained sustainable access to modern energy services on household level amounts to **9.26 million** (Graph 2). The total number of social institutions and enterprises benefitting from EnDev is more than 8,000 and 20,000, respectively.

EnDev is continuously analysing the impacts of the different country activities to verify the assumptions regarding the impact of energy development measures, the links between energy for development and the Millennium Development Goals and to check the sustainability of the EnDev results and impacts. Up to now 23 baseline, 49 impact, 13 sustainability and 8 socio-economic studies have already been carried out. Recently impact studies in Ghana

(grid densification), Mozambique (grid densification), and Peru (improved cookstoves) as well as a sustainability study in Uganda (improved cookstoves) have been completed. Furthermore, multiple studies are on-going and planned.

As an example the main findings of the Mozambique study are summarized in the text box.

Modern and clean energy services with improved energy efficiency reduce the emission of greenhouse gasses. To calculate EnDev-induced savings, UNFCCC's methodology is being applied.[1] Conservative assumptions based on EnDev's expertise (impact studies etc.) are made whenever default values are not provided within the methodology. The major share of the CO_2 emissions avoided originates from biomass saved in improved cookstoves. As an exception EnDev uses 50% as default value for non-renewable biomass compared to default values of between 82% and 92% (as provided by UNFCCC).[2] This is in line with the EnDev philosophy of always being conservative when claiming outcomes and impacts. This conservative approach leads to total calculated savings of 978,984 t / CO_2 per year.[3] Applying 82% as default value for non-renewable biomass in the calculation of stove savings, the total would amount to 1,585,358 t / CO_2 per year.

Impact study Mozambique grid densification

One major effect of electrification was on the use of kerosene, which is only used by around 30% of connected households anymore, whereas 83% of non-connected households resort to kerosene for lighting. Also new services are available to project beneficiaries. TV sets are almost ubiquitous and the number of DVD recorders amounts to nearly 70%. 14% of the households own a refrigerator, of which around 10% are used productively. These households are now selling food, cooled drinks and ice cubes, which is a profitable business. Altogether, households seemed to mostly benefit from modernization effects due to improved access to information through television, etc. as well as increased convenience.

Another effect is the inclusive character of grid connection: electricity helped to overcome the feeling of being excluded from society. All these impacts are highly appreciated by the beneficiaries. Finally, the grid densification project helped to draw the Mozambican power utility's attention to the relevance of improved electricity access facilities for poorer households.

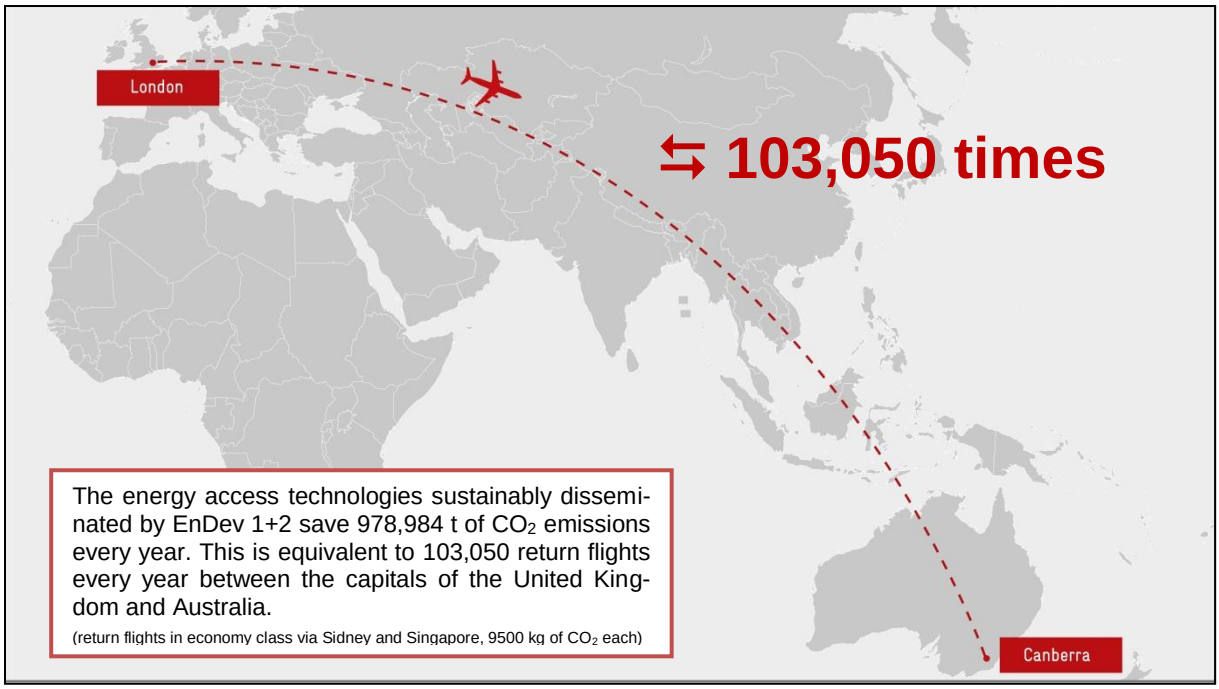
[1] AMS-III.AR; AMS-I.A; AMS-I.F; AMS-II.G; http://cdm.unfccc.int/methodologies/SSCmethodologies/approved

[2] http://cdm.unfccc.int/DNA/fNRB/index.html

[3] For the time being the CO_2 savings per year are only calculated for solar home systems, off grid hydropower, pico pv and improved cookstoves of EnDev 1 and EnDev 2, which were present in June 2012. The calculation is according to UNFCCC based on default values and were necessary own assumptions.

- a household provided with electricity saves fuel of two kerosene lanterns (0.15 t / CO_2 per year)
- a household with an improved cookstove saves 0.54 t / CO_2 per year

Within EnDev the adjusted outcome figures are used to calculate the CO_2 savings. However, only the Replacement Factor (sustainable used systems) and the Windfall Gain Factor (systems would have been sold even without EnDev) are applied. The Double Energy Factor will not be applied, as both "electrical systems" as well as improved cookstoves contribute to CO_2 reduction.



The table below gives an overview of firewood and CO_2 emissions saved per year thanks to EnDev 1 and 2 for the different technologies:

technology	systems / connections	saved t of firewood / year	saved t of CO_2 / year
PV	186,028	n/a	28,518
pico PV	964	n/a	148
off-grid MHP	21,282	n/a	2,860
stoves	1,767,277	1,548,134	947,458
		Total	**978,984**

C. Overview about planned country activities in 2013 under EnDev 2

The total budget of the second phase is currently EUR 173.9 million. DGIS already decided to increase its contribution to EnDev by EUR 4 million earmarked for stove activities in Mozambique. In addition the Swiss Agency for Development and Cooperation (SDC) is planning to join the EnDev partnership. A decision is expected end of October. The present up-scaling proposals are already including the additional funds from DGIS but not taking into account the possible additional funds for SDC.

The governing board of the programme approved up to now 20 projects in 19 countries. Some projects are on-going without any further need for up-scaling and extension of the project period (Tab. 1). Some other country activities are foreseen to be extended without up-scaling (Tab. 2). Some countries are planning to increase their activities within the current project period and apply for additional funding (Tab. 3). In other cases up-scaling is linked to an extension of the project period (Tab 4). In addition, it is planned to start new activities in three countries (Tab. 5).

Tab. 1: On-going country activities under EnDev 2 **without changes**

Country	**Activities**	**Project Duration**		**Funding**	**Planned outcomes on household level**
		Start	**End**	**in EUR 1,000**	**In persons**
Ethiopia	r.e., stoves	01/10	12/13	9,900*	655,000
Ghana	grid	01/10	06/14	1,650	600 MSMEs
Honduras	r.e., stoves	06/09	12/14	4,130	49,300
Nicaragua	r.e.	06/09	12/14	4,140	49,000
Indonesia	solar, hydropower	05/09	06/14	9,000	112,000
Kenya	pico PV, stoves	06/09	12/14	5,800*	3,770,000
Liberia	pico PV, solar dryer, stoves	05/12	12/13	750*	10,500
Rwanda	hydropower, biogas	10/09	12/13	7,200	40,244

* plus variable up-scaling upon achievement of milestones (see country sheets)

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

Country	**Activities**	**Project Duration**			**Funding**	**Planned outcomes on household level**
		Start	**Old end**	**New End**	**In EUR**	**In persons**
Benin	rural electrification	01/10	12/12	12/13	1,600,000	15,399

Tab. 3: Country activities intended to **be up-scaled** within the current project period

Country	Activities	Project Duration		Funding in 1,000 EUR		Planned outcomes on household level (persons)	
		Start	End	Old Funding	New Funding	old	new
Bolivia	r.e., stoves	10/09	12/14	8,400	9,400	462,000	512,000
Burkina Faso	stoves	10/09	12/14	1,500	3,500	300,000	500,000
Peru	grid, SHS, stoves	06/09	12/14	6,400	7,900	335,000	435,000
Senegal	r.e., stoves	04/09	12/14	7,200	8,500	459,700	559,700

Tab. 4: Country activities intended **to be scaled up and extended**

Country	Activities	Project Duration			Funding in 1,000 EUR		Planned outcomes on household level in persons	
		Start	Old End	New End	Old Funding	New Fund-ing	Old target	New tar-get
Bangladesh	stoves, solar	06/09	03/14	12/14	7,850	8,850	1,240,000	1,420,000
Benin	stoves	10/09	12/13	12/14	2,000	4,000	400,000	800,000
Burundi	r.e., stoves	09/10	06/13	12/14	900	1,500	11,000	131,000
Mozambique	r.e., stoves	10/09	12/12	12/15	3,800	10,800	45,600	321,000
Nepal	grid, hydro-power	05/09	12/13	06/15	2,640	4,740	141,177	240,637
Uganda	r.e., stove	04/09	12/12	12/14	4,000	6,000	1,129,000	600,000

Tab. 5: **New country activities**

Country	Activities	Project Duration		Funding	Planned outcomes on household level
		Start	End	In 1,000 EUR	In persons
Cambodia	biogas	12/12	12/14	2,000	58,515
Honduras / Nicaragua[4]	stoves	12/12	12/14	3,000	250,000
Indonesia	biogas	12/12	12/14	1,150	20,000
Madagascar	stoves	12/12	03/14	300	47,500
Malawi	stoves	12/12	03/14	250	62,500
Mali	BCS, minigrid	01/13	12/14	850	0[5]
Tanzania	stoves	12/12	12/14	500	45,000

[4] The acitivities planned in this proposal will be integrated into the existing country measures in Honduras and Nicaragua instead of setting up a seperate regional project.
[5] New proposal for ELCOM3 to secure sustainability of ELCOM1 and ELCOM2 outcomes in the view of the political situation.

D. Overview about planned general EnDev activities

Cooperation with other organisations and initiatives

In recognition of the importance of energy access for sustainable economic development and supporting achievement of the Millennium Development Goals, the United Nations General Secretary established the **Sustainable Energy for All Initiative (SE4All)** with the aim to achieve universal access to modern energy by 2030. EnDev has contributed actively to events and campaigns that are linked to the UN initiative. In particular EnDev illustrated the results and lessons learnt of the partnership programme in several publications and participated in relevant conferences and workshops, such as the Abu Dhabi conference and the Task Force 1 meetings of the SE4All initiative. EnDev will continue to contribute to the initiative especially participate in the discussions about the definition and criteria of energy access and support action plans on country level.

In countries that are part of the **energy+** initiative, EnDev will coordinate its activities with those planned by Norway and partner country. EnDev generally follows a bottom-up approach, which is complementary to governmental measures that are part of the Result Based Approach of the energy+ initiative. EnDev will provide the lessons learnt of its programme and contribute to capacity development of partner organisations as part of energy + activities.

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

EnDev is cooperating with several **World Bank** Programs on national as well as on international level including the **Lighting Africa** initiative and the **African Electrification Initiative (AEI)**. Lighting Africa, EnDev and the Fraunhofer Institute of Germany initiated a joint process to establish an international quality and testing norm for solar lanterns. EnDev provided lab test and field test data of solar lantern used in their country programs. In addition, EnDev is supporting the development of a battery test procedure which is crucial to assess the lifetime of batteries in solar lanterns.

EnDev is discussing with **ADB** a possible cooperation on the Energy for All agenda. ADB is interested in identifying innovative and successful project concepts that might be up-scaled with ADB loan funding, and sees EnDev as a possible source for new (but bankable) concepts, as well as a program providing 'pilots' that can be directly scaled up by ADB loan financing. Scaling up activities and transferring them into a more loan and less grant oriented environment is interesting from EnDev's sustainability perspective too, although in the first phases of such a loan additional EnDev support (in terms of TA and grants) might still be required. It was decided to explore possible cooperation pragmatically on the country level, starting in Bangladesh (cooking energy) and in Indonesia (rural electrification). In both countries ADB is preparing new activities in which a role for EnDev (piloting, TA) is envisaged. Both are still at early stage, EnDev will follow-up on the discussions and inform on developments in the 2012 progress report.

EnDev actively contributes to the **Global Alliance for Clean Cook Stoves**. EnDev experts are participating in working groups of the alliance and provide other kind of support. In addition, EnDev will be part of the core group on Energy Access Indicators of the Energy Sector Management Assistance Programme (ESMAP) and continue to be a member of the task force on off grid lighting of the UNEP en.lighten initiative.

Impact Monitoring and Evaluation

As described in chapter B EnDev is investing significant resources in the monitoring of outcomes and impacts. In 2013, EnDev will extend the monitoring especially in the field of biomass use and saving, and greenhouse gas emissions. Additional activities in the field of impact monitoring and evaluation in 2013 will be:

- Implementation of at least two impact studies related to a specific approach, topic or technology (health, productive use, etc.).
- Development of a set of market development indicators.
- Finalization of the developed quality criteria for impact studies and assessment of all recent (2011 and 2012) and new impact studies according to these criteria.
- Provision of follow up to EnDev countries on implemented impact studies in order to increase the lessons learnt from the studies.
- Design a set of recommendations and a standard procedure for impact studies for the EnDev countries in order to create more uniformity and quality in the impact monitoring within EnDev (preferred indicators, sampling, time frame, methods, etc).
- Implementation of sustainability assessments in at least two EnDev countries based on the framework further developed and tested in 2012.
- Development of a quick sustainability scan for EnDev countries based on the scientific framework so that projects can assess easily their own sustainability.
- Sharing monitoring and evaluation experiences by expanding and managing the toolbox (such as result chains, sample questionnaires, other tools) in energypedia and in the EnDev-Wiki.

Energypedia

As indicated in the last Annual Planning, energypedia is now constituted as an independent non-profit organisation since March 2012. The “energypedia UG” is in charge of www.energypedia.info and responsible for its operation and continuous development. These formal changes will not affect the users in any ways. Energypedia will remain an open and free knowledge platform for sharing information about renewable energies.

The outsourcing of www.energypedia.info to an independent organisation was mainly done to assure the sustainability of energypedia and to avoid that funding for energypedia depends on the project life span of Energising Development

Since April 2012 an additional energypedia consultancy was founded offering commercial services like customer-specific wiki solutions, web based monitoring tools and trainings. Profits will be transferred to the existing non-profit organisation allowing a more independent financing. The overall goal of all these organisational changes is the sustainable build-up of stable structures and a smooth operation of www.energypedia.info.

The EnDev-Wiki is one of the restricted workspaces within energypedia and is the common interaction platform for all EnDev stakeholders and aims to improve the workflow efficiency.

In 2012 an online publication database for impact studies was developed and for 2013 a tool for the EnDev country manager will be developed to optimize their workflow.

Public Relation Activities

EnDev financed missions of journalists to Ethiopia and Kenya. The journalists prepared two „showcases“ brochures showing the success and lessons learnt of the EnDev approaches in the two countries(http://endev.energypedia.info/index.php/EnDev_Publications).

EnDev contracted the communication agency Netzhammer&Breiholz to develop a communication strategy for EnDev allowing more directed public relation activities of the program as well as a more efficient use of the information and experiences gained on country level. The draft communication strategy is expected to be finalized end of 2012 and will be presented to the Governing Board during the next meeting in 2013.

In 2013, EnDev will have facilitated access to modern energy technologies and services to 10 million people. It is suggested to celebrate the 10 millionth person who got access to modern energy, as EnDev is the first international program that achieved such a high number of beneficiaries in the field of access to energy. It is planned to organise two events: one event in Europe and another in Africa where the 10 millionth beneficiary will be celebrated.

E. Status of country activities

Bangladesh

Promoted technology	Solar Home Systems, pico PV systems / stoves			
Project budget	EUR 7,850,000	**Spent until reporting date**	EUR 4,525,834	
Project period	06.2009 – 03.2014	**Reporting period**	06.2012	
Lead executing agency	Bangladesh Ministry of Power, Energy and Mineral Resources			
Implementing organisation	GIZ			
Implementing partners	Infrastructure Development Company Limited (IDCOL) and 29 private companies (SHS), 115 NGOs (Stoves) in Bangladesh			
Involved bilateral / multilateral 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 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in households	740,000	585,310	747,882	people
Cooking energy for households	500,000	184,250	190,163	people
Electricity and / or cooking energy for social infrastructure				institutions
Energy for productive use / income generation				SMEs

Project strategy and key components

In 2010, EnDev-Bangladesh finished its support for the dissemination of typical solar home systems (25–225 Wp) as the market for these products became more and more self-sustainable. However, a significant number of poorer households in villages stay unserved as they cannot afford these systems. Therefore, EnDev-Bangladesh started to support the dissemination of small solar home systems (SSHS, 10 to 20 Wp) by applying the former SHS approach. Partner organisations, which receive financial and technical assistance, sell the system to households at a slightly subsidized price, based on grants from EnDev. The overall management of the project is done by the Infrastructure Development Company Limited (IDCOL). IDCOL is responsible for the contracting and monitoring of the 29 partner organisations involved in the dissemination of SHS / SSHS.

EnDev intends to introduce also pico PV systems (1-10 Wp) on large scale. These systems are already available on the market. However, poor quality products are dominating spoiling the image of pico PV systems. EnDev tries to raise awareness for quality through consumer information and systematic introduction of competitive quality pico PV systems. Lamps will be eligible for a result based subsidy whose amount depends based on the systems lighting performance parameters.

In the field of improved cookstoves EnDev has been working with dozens of partner organisations that organized installations of the ICS in households through professional stove builders. EnDev supported training of trainers for stove builders, provided financial support for the marketing of ICS, and introduced quality assurance and monitoring mechanisms.

Project progress (overall progress towards outcome target EnDev 2)

Since SHS dissemination started in 2003, more than 1,500,000 SHS and later SSHS have been sold through the IDCOL distribution scheme. Within the last six months, 3,133 SSHS received financial support by EnDev. The average sales figures in 2012 of around 31,000 SHS per month indicate that a sustainable and vital market for solar appliances is

nearly completely established. EnDev contributed significantly to this sector development. There-fore, EnDev counts 10% of IDCOL's SHS sales since funding was phased out (December 2010) considering that other organisations also contributed to this development. This amounts to 51,470 systems (from a total of 514,700 sold systems) which equals 283,115 additional persons provided with electricity and counted under EnDev 2. Initially, further support for SHS and SSHS was not planned. However, IDCOL indicated a need for additional funds for subsidies to extend the scheme for SSHS until end of 2014. A new contract with IDCOL for the support of SSHS is currently being finalised.

Pico PV activities are one and a half year behind schedule. The baseline study, which should provide a better picture of the lighting demand, caused delays due to necessary rework on the report. In parallel, EnDev has been successfully working towards the reduction of import taxes on small solar PV products from 150% to only 35%. Due to these delays, the field test with 4,000 lamps was postponed to spring 2012. In the reporting period products which meet the technical requirements set by EnDev-Bangladesh were not yet available in the country. The field test is now expected to take place in the 2nd half of 2012. IDCOL has already indicated to provide refinancing capital if the field test is successful.

Within the reporting period 15,893 ICS were constructed by the contracted partner organisations (last contracts were signed in June 2011) raising the total figure within EnDev 2 to 44,393 stoves representing around 220,000 beneficiaries. However, the efficiency of the stoves is still under investigation so that the outcome number was reduced to 190,000.[6] There are good chances that the market for improved cookstoves will be established soon and distribution will continue by itself. A CDM project approved in September 2011 will support this process.[7] The CDM project's CERs will be bought and monitored by J.P. Morgan Ventures Energy Corporation. Two management entities are working under the POA: SZ Consultancy Services Ltd. bundles the distribution of several individual agents while Grameen Shakti manages its own stoves. The interest in the GIZ / EnDev initiated ICS activities is rising internationally and Bangladesh has become one of the focal countries for interventions of the Global Alliance of Clean Cookstoves (GACC) and the Climate and Clean Air Coalition (CCAC). In fact under the name "Mission 21" the Government of Bangladesh has launched the ambitious plan to provide 100% of all households with ICS by 2021.

Sustainability

Several profit-oriented organisations established a nationwide sales network. Demand for SHS is expected to remain high as energy demand in the entire country is increasing faster than the supply. The monthly sales figures of SHS show that a sustainable market is about to be achieved. The scheme under IDCOL has an in-built annual reduction of subsidies. Subsidies for SHS will be phased out by end of 2013, funding for SSHS until end of 2014.

Similar to SHS / SSHS, the approach for pico PV is to stimulate the market through a subsidy scheme and to reduce subsidies when the market is taking up. IDCOL stated to continue pico PV activities once the technology is proven using its extensive countrywide supplier structure. Assuming a high demand for these systems a sustainable market can be established within a very short timeframe.

While EnDev has phased out the direct financial support of ICS, certain rules allow direct financial contributions for stoves despite the CDM additionality clause in LDCs and Bangladesh specifically. A further direct incentive is therefore under consideration by the government. Further EnDev activities will aim at measures of capacity development of SZ Consultancy Services Ltd, former partner organisations and users as well as stove tests, and quality assurance in order to stabilize the market.

[6] A (statistically not representative) controlled cooking test (CCT) carried out by the Aprovecho Research Center (ARC) indicates that the promoted stove fulfils the EnDev requirements of fuel saving, especially for longer cooking tasks. Further CCTs will be conducted alongside with CO/PM2.5 exposure measurements to assess the stove's performance further. Until final results are available outcome figures will be considerably reduced.

[7] EnDev will count up to 25% of CDM registered stoves due to its sector development.

Benin stoves

Promoted technology	Stoves			
Project budget	EUR 2,000,000	**Spent until reporting date**	EUR 1,128,386	
Project period	10.2009 – 12.2013	**Reporting period**	06.2012	
Lead executing agency	Ministry of Agriculture			
Implementing organisation	GIZ			
Implementing partner	Ministry of Energy			
Involved bilateral / multilateral programmes	ProAgri Promotion de l'Agriculture (BMZ)			
Target (number of beneficiaries)	**Target till project end**	**Achieved till 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in Households				people
Cooking energy for households	400,000	137,263	259,902	people
Electricity and / or cooking energy for social infrastructure	0	(21)	(6)	institutions
Energy for productive use / income generation	0	(131)	(0)	SMEs

Project strategy and key components

In the first phase, EnDev-Benin promoted a variety of efficient cookstoves in a rural area in the North-West of Benin. EnDev supported the market introduction of new types of improved cookstoves. The stoves were sold without direct subsidies. In addition, EnDev strengthened the demand by awareness raising and consumer information. However, at the end of the first phase there were still some weaknesses concerning the quality of the stoves and the sustainability of the market to be addressed. These issues are taken up in second phase of EnDev.

Activities to improve stove quality as well as production capacities particularly for charcoal stoves are in the centre of component 1. The extension of the program interventions beyond the North-West are the focus of the second component. Particularly the urban centres in the South have been selected as an additional interesting market for improved cookstoves. Additionally, another area in the North-East has been selected for an extension of the work in rural areas based on the implementation concept developed in the North-West.

Project progress (overall progress towards outcome target EnDev 2)

Results of EnDev 2 have almost doubled compared to the last reporting period, so that 65% of the overall target is already achieved. At the same time, only 56% of the overall funds have been spent. Based on scenario calculation, the actual growth in beneficiaries has reached the theoretical linear growth pattern and there is a good chance to reach the target until December 2013.

Component 1

Stove sales have increased by 8% as compared to the same period a year ago. Mud stoves have shown a considerable growth. This is the result of a technical training of new dynamic producers. The activities of the semester have focused especially on (i) the introduction of the new label "Anfani" and marketing activities, (ii) the application of quality standards by the producers, (iii) strengthening the distribution network of the producers, and (iv) the support for the establishment of stove producer associations at the communal level.

Component 2

This is the first full semester of production of stoves in the South. An overall of 45,000 stoves was sold this semester in two new intervention zones. The focus of activities has been given to (i) increase production capacities and raising the productivity of the producers, (ii) develop and handle marketing and awareness raising tools, and (iii) develop a distribution network together with the producers.

Besides the specific work for the two components, a laboratory for emissions test and water boiling test (for charcoal stoves) was set up at the EnDev-Benin office in order to undertake quality control and technology development research. This was necessary for the fine-tuning of the new Éclair charcoal stove for its introduction to the market. The first stoves were produced and sold within the last months of the reporting period. First users of the Éclair have been interviewed for the fine tuning of the design in preparation of the massive dissemination (in two sizes) in June.

Sustainability

Component 1

EnDev-Benin has started a step by step phasing out process in the old intervention zone. In April 2012, the number of activists for this region has been halved in the contract with the "Association des Communes de l'Atacora et de la Donga".

Component 2

Work has just started recently.

Large cookstoves for social institutions and productive use had been promoted in EnDev 1. For EnDev 2, this component has been stopped and no targets have been set. However, the continued monitoring has shown that even two years after the end of phase 1, the level of stoves within lifespan remained at the same level. There is, however, a recent downward trend of sales, which remains to be observed.

Further information

A new type of stove has been developed. The so called "éclair" stove has thoroughly been tested for emissions. It shows a significant reduction in CO emissions compared to its baseline stove and is in the same league as some of the industrially produced charcoal stoves. The stove has attracted the interest of other programs and will be integrated in a long term durability test in Haiti under USAID funding.

Benin rural electrification

Promoted technology	Grid		
Project budget	EUR 1,600,000	**Spent until reporting date**	EUR 1,584,721
Project period	10.2009 – 12.2013	**Reporting period**	06.2012
Lead executing agency	Ministère de l'Energie, des Recherches Pétrolières et Miniers, de l'Eau et du Développement des Energies Renouvelables (MERPMEDER)		
Implementing organisation	GIZ		
Implementing partners	Société Béninoise d'Electricité et d'Eau (SBEE), local communities, Agence Béninoise pour l'Electrification Rurale et la Maitrise de l'Energie (ABERME), Consortium CERABE / DERANA-ONGs (NGO)		
Involved bilateral / multilateral programmes	BMZ-GIZ Decentralization Programme & BMZ GIZ Water Programme, EU-Energy Facility, Agence Française de Développement (AFD)		

Target (number of beneficiaries)	**Target till project end**	**Achieved till 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in households	15,399	8,519	8,519	people
Cooking energy for households				people
Electricity and / or cooking energy for social infrastructure	79	68	68	institutions
Energy for productive use / income generation	39	53	53	SMEs

Project strategy and key components

The rural electrification project of EnDev-Benin targets grid extension and densification through a cooperation with the national utility SBEE. The project introduced adequate structures for tariff collection (pre-paid meters, group connections) and downsizing of technical standards to fit rural electricity use circumstances, and contributes to investment financing. It is supporting SBEE in the tendering process for the concessions of grid extensions to local electricity supply companies. In addition, the project aims to develop non-grid power supply options through the rural energy agency ABERME. Under EnDev 1, fully financed by EnDev, twelve villages were electrified. EnDev 2 is part of a EUR 21 million basket financing program. EnDev contributes EUR 1.6 million, the EU Energy Facility EUR 7.7 million, ADF EUR 7.8 million, BMZ EUR 1.5 million and SBEE EUR 2.4 million. The aim of the program is to electrify an additional number of 105 villages (redesigned without budget change from an original objective of 59). The implementation of a renewable energy off-grid component was cancelled with approval of EU in order to mobilize an additional sub-budget required for the procurement of around 7,000 electricity meters.

Project progress (overall progress towards outcome target EnDev 2)

No connection has been accomplished under the EnDev 2 Energy Facility component yet, in spite of earlier planning and expectations to finish construction and start connecting households (current progress numbers are results from the EnDev 1 activities but realized under EnDev 2). Main reasons are difficult and time-consuming tendering procedures and subsequent delays in procurement of required materials and equipment, the departure of the former team leader / project manager in June 2011 and difficulties in finding a qualified succes-

sor, and loss of poles by fire accidents. However, meanwhile the project is underway and construction works on site have started in January 2012.

EnDev budget has been spent first. Expenditures are now fully drawn from the other contracted funds but outcomes will be – as agreed – proportionally shared over the whole basket.

Since the new project manager has started early 2012 good progress was made. The status of EnDev 1 villages including the assessment of the number of new customers will be verified before end of 2012. (These new customers had been indicated earlier by SBEE and also experienced by the project; however they had not been verified systematically.) Next the opportunities for restarting the off grid RE component with ABERME will be assessed.

Within the Energy Facility Program 105 villages with an estimated population of 220,000 (16,800 connections + 2,500 streetlights) will be connected to the grid until 06 / 2013. The project now is well underway and construction works on the sites have started in January 2012 regarding installation of power poles, cables and transformers. At present around 10,000 electric meters have been ordered and will arrive on-site in 11 / 2012. Their installation will start in 12 / 2012 and so by the end of 2012, more and more households, small businesses and social institutions will be connected to the grid. Another 6,500 electric meters will be shipped to Benin in 02 / 2013 and be installed at the remaining villages. The project will thus provide access to electrical energy for around 220,000 people by 07 / 2013, of which 18,429 will be accountable to EnDev 2.

At least since 07 / 2012 the project is increasingly facing problems with the insufficient output and engagement of the NGOs, contracted by the Ministry of Finance and financed by AFD. Due to irregularities of the NGO's accounting system, AFD has stopped its contributions and the NGOs are facing a financial audit by 10 / 2012. No salaries or expenses will be paid to the staff of the NGOs starting 01.07.2012. As the output of the NGOs is supposed to be an essential factor of the project architecture, the project is now looking for solutions.

Sustainability

Preparatory measures by NGOs well before electrification in EnDev 1 proved their value in promoting higher connection densities and customer understanding, thereby improving the chances of sustainability. Therefore, the same approach has been chosen for the on-going project. Since the beginning of EnDev 1 SBEE did not report any disconnections which carefully indicates sustainability too. This, however, will also be verified before end of 2012.

Sustainability can also be supported anecdotally: The project has significantly increased the mobilization of the target group: villagers increasingly demand SBEE officials for being connected to the grid in the near future and villages already connected demand for an additional grid extension. New businesses and start-ups have been developed in the villages. For example, in the village of Kansoukpa, newly electrified by EnDev 1, a woman who previously worked in Cotonou returned to her native village in order to establish a new business center (computer, photocopy). As a result, her income has increased significantly because of the high demand for office services which could not be satisfied previously. In the village of Toucountouna a sawmill has been installed; in Kolonkondé, a fishmonger's and an ice production were established. A survey will be performed in the 12 villages of the EnDev 1 project in autumn (delayed from spring) 2012 to appraise the impacts of the electrification upon the socio-economic framework compared to the baseline survey carried out just before the villages were connected.

Bolivia

Promoted technology	Solar / Biogas / Stoves / Hydro / Grid / pico PV			
Project budget	EUR 8,400,000	**Spent until reporting date**	EUR 4,942,143	
Project period	10.2009 – 12.2014	**Reporting period**	06.2012	
Lead executing agency	Ministry for Hydrocarbons and Energy, Vice Ministry for Electricity and Renewable Energy			
Implementing organisation	GIZ			
Implementing partners	Vice Ministry for Electricity and Renewable Energy, business associations, NGOs, municipalities, communities, cooperatives, electricity utilities			
Involved bilateral / multilateral programmes	PROAGRO (BMZ), PROAPAC (BMZ), IDTR (World Bank), PEVD (Interamerican Development Bank).			
Target (number of beneficiaries)	**Target till project end**	**Achieved till 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in households	300,000	115,025	127,390	people
Cooking energy for households	162,000	167,135	182,682	people
Electricity and / or cooking energy for social infrastructure	2,700	1,573	1,920	institutions
Energy for productive use / income generation	11,200	7,467	8,185	SMEs

Project strategy and key components

Due to the high outcomes and high cost efficiency in previous periods the project will not change its strategy. It is basically supporting organisations that are already proactive in the field of access to energy. In this way the project is able to mobilize local economic resources with a strong participation of the direct beneficiaries and / or implementing partners at the national, regional or local level. Interventions are demand-driven.

The project's main activities focus on co-financing energy access and on developing local capacities through advice and assistance for national programs targeting energy access in rural areas. Advice focuses on planning, implementation and M&E. The project strategy also integrates support to and involvement of regional and municipal governments as well as NGOs and the private sector, leading to a considerable mobilisation of their funds.

Within the sustainability strategy, the project concentrates on the following key components:

- Design of policies and co-financing mechanisms to grant better access to energy.
- Training of and advice to producers / retailers / providers in the provision of modern energy products and services and in building markets (stoves, pico PV, biogas).
- Support of local stove and biogas plant installers as a job creation opportunity.
- Support awareness and public relations campaigns about indoor air pollution, productive energy use, 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 and followed by the project's M&E system.

Project progress (overall progress towards outcome target EnDev 2)

The project is focusing on consolidating the developed strategies within local actors' programs or projects. The intervention concept is similar to former years but with more empha-

sis on developing capacities in local counterparts, while retaining the logic of working demand-driven and at the same time minimizing subsidies per household or per person.

A new national stove program is expected to begin in 2013. EnDev has coordinated the design of this program with Vice Ministry for Electricity and Renewable Energy (VMEEA) and World Bank, sharing lessons learnt and offering technical advice.

EnDev also worked in the elaboration of a National Norm for Improved cookstoves in alliance with the Vice Ministry of Households, Ministry of Health, Ministry of Education and the public University of San Andres.

The 2nd International Meeting on Improved Cook stoves was organized in La Paz. Stove producers, National Government, municipalities, universities and local stove producers exchanged experiences and evaluated implementation of ICS in Bolivia. A working agreement was established for the construction of more than 600 institutional stoves.

Grid densification activities continue to be part of the Supreme Decree N°26935. More intensive participation of the National Program for Electrification had been expected but was hampered by legal constraints. EnDev is working with VMEEA to overcome these. EnDev and the public utility collaborated on projects demonstrating that the methodology reaches the country's poorest households. 8,000 new connections are expected for next semester.

A pilot phase for pico PV will be launched with VMMEA and IDB, focussing on subsidy minimization and microfinance provision. 1,000 lamps will be introduced in the Amazon.

Activities regarding productive uses of energy are moving as planned, focusing in impact oriented interventions. The project developed materials on “Energy for productive activities as a transversal issue”, which can be used in any energy access project.

Biogas activities were handed over to partners in mid-2012. An event with all actors was held in order to create a network that continues without EnDev’s technical assistance.

For social infrastructure, EnDev activities concentrated in strengthening sustainability while continuing to support new projects, e.g., design of solar equipment for schools and health centres, work on specifications, and technical advice to municipalities.

Sustainability

The different components of the project are working with their partners in order to achieve sustainability by creating ownership of the intervention strategies. The project is also working with key actors in order to maintain and secure scaling-up and technology transfer.

All know-how, lessons learned and expertise are shared and will be systematized in documents of public access. Some of them are already available on the web page.

Project staff is working with the Vice Ministry to plan and execute the project interventions and to coach the technical team in order to consolidate the strategy within the National Policy.

In the case of the natural gas support, the national oil and gas company (YPFB) has declared the company’s full support for social infrastructures that require access to natural gas. This decision was in part based on a small field study carried out by EnDev in 2011. As a first step, around 30 social infrastructures will benefit from equipment donated by YPFB until June 2012 (pilot phase).

The project made a new planning workshop in order to review the handover strategy and each of the working units are closing some activities and starting the new phase towards the achievements envisioned for 2014.

Further information

- www.endev-bolivia.org

Burkina Faso

Promoted technology	Stoves		
Project budget	EUR 1,500,000	**Spent until reporting date**	EUR 1,226,953
Project period	10.2009 – 12.2014	**Reporting period**	06.2012
Lead executing agency	Ministry of Environment and Sustainable Development		
Implementing organisation	GIZ		
Implementing partners	Government institutions, business associations, NGOs, IRSAT		
Involved bilateral / multilateral programmes	Decentralization and Communal Development (DE); PASE-WB; CILLS-SNV (NL)		

Target (number of beneficiaries)	**Target till project end**	**Achieved till 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in Households				people
Cooking energy for households	300,000	217,170	349,529	people
Electricity and / or cooking energy for social infrastructure	450	471	813	institutions
Energy for productive use / income generation				SMEs

Project strategy and key components

The objective of FAFASO is to establish a commercially viable supply-demand system for improved cookstoves in Burkina Faso on national level. To achieve this purpose, FAFASO chose a regional stepwise approach: starting in the country's biggest cities (Ouagadougou and Bobo), FAFASO expanded first into the smaller towns in the priority zone of German Development Cooperation (in the south-west and the east of the country). Under EnDev 2, the intervention zone was extended to other small towns and rural areas in the central, western and southern parts of the country.

Apart from household stoves, other key components are large scale stoves for schools and restaurants as well as special cooking devices for beer brewing and shea butter processing, developed together with IRSAT.

Key elements of the intervention strategy are training of producers, the support of producers' associations (organisational support and capacity development for quality control, lobby work and marketing activities), the strengthening of the commercial chain, awareness campaigns on national (e.g. TV, radio, institutional lobbying) and local level (cooking demonstrations).

Project progress (overall progress towards outcome target EnDev 2)

The overall target for cooking in households has already been achieved. Since the last reporting, the outcome has been increased by 20%. Sales in Ouagadougou and Bobo are remaining constant (approximately 26,000 stoves annually), while in the new areas sales have increased during the last two years. FAFASO managed to transfer the commercial stove dissemination approach from the large towns into smaller towns and peri-urban areas. The investments into capacity development and public awareness are now paying off. The promotion of ceramic stoves has just started after problems with the kiln technology have been overcome last year.

While the overall sales of large stoves for social institutions and productive use have increased a lot, it has been difficult to find out how many have been sold to schools and how

many to SMEs, respectively, as these are the same stove models, coming from the same producers. Lobbying activities have been increased during reporting period especially for the equipment of school canteens. Thanks to these activities, 250 schools have been equipped with ICS. Some large institutions have made firm commitments, and the parliament of Burkina Faso will integrate budgets for the purchase of stoves for schools into the national budget.

In some regions, the trained artisans have already supplied nearly all beer brewers with improved cookstoves. This has been found out during investigations for the reasons of declines in sales figures in these areas. To address this situation, the artisans will be trained on a different product (shea butter processing stove) and will be oriented to search for markets in more remote areas during the next reporting period.

FAFASO is progressing fast towards achieving its outcome target, within budget. On the other hand, substantial challenges remain in the sector: especially the introduction of the new developed shea butter stove and the extension of the beer-stove to the most beer-producing regions in the capital's adjacent regions. Therefore, a substantial top-up funding is foreseen for the second half of 2012.

Sustainability

The phasing out of the direct support of the producers in Ouagadougou and Bobo has been completed at the end of 2011. Within this phased approach, the cooperatives in these two cities took over the key activities (order management, quality control, and marketing) and have since implemented them on their own. As expected, this change resulted in a gradual reduction in sales figures. However, sales are now stabilizing at a slightly lower level than at their peak approximately two years ago. This indicates that the producer associations have managed to assume their role. The sustainability of the achievements in Ouagadougou have be investigated mid-2012. Results of the study will be available at the end of the next reporting period. Similar handover processes have been initiated in the first expansion areas in order to free FAFASO's capacities for the new intervention areas. In general, metal stove producers are more advanced in the handing over process as compared to the masons and the ceramic stove producers. FAFASO will need more time and inputs to bring these two types of producers to the same level of maturity.

Further information

The co-financing from EU's 2nd Energy Facility helps FAFASO to cover the northern part of the country. It is also facilitating synergies with similar EnDev programs in the region.

Burundi

Promoted technology	Solar / Stoves			
Project budget	EUR 900,000	**Spent until reporting date**	EUR 344,009	
Project period	09.2010 – 06.2013	**Reporting period**	06.2012	
Lead executing agency	Ministry of Energy and Mines (MEM)			
Implementing organisation	GIZ			
Implementing partners	DGHER – General Directorate of Water and Rural Energies IFDC – International Fertilization and Development Committee via Catalyst SEW Project			
Involved bilateral / multilateral programmes	GIZ Decentralization and Poverty Alleviation project (Appui à la Décentralisation et à la Lutte contre la Pauvreté, ADLP)			

Target (number of beneficiaries)	**Target till project end**	**Achieved till 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in households	11,000	38	41	people
Cooking energy for households	0	0	6,015	people
Electricity and / or cooking energy for social infrastructure	12	0	3	institutions
Energy for productive use / income generation	30	0	10	SMEs

Project strategy and key components

EnDev-Burundi works on increasing access to modern energy services for households, SMEs and social institutions. The focus is on promotion of PV systems, ranging from pico PV lanterns up to systems for communal infrastructure. EnDev-Burundi supports capacity development on communal basis and in the private sector. EnDev-Burundi is implemented in close cooperation with the GIZ Decentralization and Poverty Reduction project (ADLP).

Initial results from the first Battery Charging Stations (BCS) suggested that battery charging might not be sufficiently profitable. Consequently the project strategy was revised and is now aiming at the creation of Solar Multiservice Stations (SMSS) in which three services are offered: phone charging, hairdressing (electric trimmers) and lighting for the shop or neighboring kiosks, restaurants or bars. The SMSS will also promote and sell pico PV systems.

EnDev will establish the link between the importers and these SMSS and organize technical and management training for the operators. As there is limited capacity to install solar systems in Burundi (few qualified technicians), this will be the major constraint. It is planned to add staff to the team to follow up on the quality of the installations. Furthermore the project focus in 2012 will be fully on SMSS, hence the installing of solar systems on communal infrastructure is postponed until 2013. The objective is to install 100 SMSS until June 2013. EnDev is handled as a mainstreaming topic within ADLP since 2012, which increases the outreach of the promotion activities.

The cooperation through knowledge exchange and joint activities with organisations working on biomass stoves (IFDC) in Burundi has been successfully completed and is proposed to be extended and scaled up.

Project progress (overall progress towards outcome target EnDev 2)

The strategy change in EnDev-Burundi towards the SMSS resulted in new planning and promotion activities, which bear first fruits. Up to June 2012 the first ten solar powered SMSS brought access to electricity to rural areas in Burundi. People have access to mobile phone charging and electric light for one to three SMEs close to the SMSS; interestingly the hair-dressing activity (with electric trimmers) generates quite some income for the SMSS owners. The number of benefitting people has not been analysed due to the short operation time and will be reported in the December 2012 report. Besides delivering energy services to the rural community, the installed SMSS also serve as promotion examples for this new type of business. “Seeing is believing” holds true in Burundi: more than 50 future SMSS operators from Gitega and Mwaro province have paid their upfront financial contribution of 30% of the investment. For future SMSS, the EnDev subsidy will be revised and progressively lowered.

Three communal infrastructures have been electrified with PV systems. In 2013 the project will continue with this component. Until then the project will also identify if there are more opportunities to upscale this component with a focus on rehabilitation of existing systems.

The Memorandum of Understanding with IFDC on improved cookstoves has been fulfilled successfully. EnDev-Burundi supported IFDC as a newcomer in the stoves sector to build up a network with GIZ colleagues, stove producers throughout Africa as well as Test Centres and international experts and consultants. This cooperation resulted in 2,005 improved cookstoves being in use now in Burundi as well as in D.R. Congo, where IFDC is also operating. To increase the impact of this cooperation EnDev-Burundi proposes to upscale the stove activities in the future.

During an EnDev project support mission it was decided that there will be no activities on promotion of MHP during the whole phase in order to put full focus on solar systems.

Sustainability

EnDev-Burundi works towards achieving sustainability through capacity development, awareness raising and provision of high quality services and products in the market. The project conducts training of technicians and organisations in maintenance systems in order to keep installations operational over their lifespan. The Department of Rural Energy in the DGHER and the grid maintenance team of the utility, in order to strengthen their capacity, are eager to cooperate on training and maintenance of solar systems, especially those installed on social infrastructure. The technicians of DGHER as well as private operators will be integrated in the maintenance structure. Network building is done between actors such as solar companies in Burundi, SMSS and a pool of technicians, suppliers of quality solar products, municipalities, provincial health facilities and education departments.

Pico PV was not foreseen to be subsidised so as to prevent market distortion. Following initial results the project now however considers it necessary to subsidise to a certain extent during a pilot / promotional phase in order to increase acceptance of such lamps.

EnDev-Burundi will also support municipalities to get access to the communal investment fund to be able to invest in electrification in the future. EnDev-Burundi partners on national level are always present in monitoring and evaluation meetings. More ownership is taken over on national level as compared to the start of the project. The association to promote solar energy in the province of Gitega founded by the solar technicians trained in June 2011 will be continuously supported and implicated in all EnDev activities.

In 2012 the energy sector working group that was created in 2011 by the Minister of Energy and Mines started to put rural electrification on the agenda for the first time. The working group is not fully operational yet.

Further information

Stove test results: https://energypedia.info/index.php/Stove_test_results_EnDev_Burundi

Ethiopia

Promoted technology	Solar / Biogas / Stoves / Hydro		
Project budget	EUR 9,900,000[8]	**Spent until reporting date**	EUR 7,461,387
Project period	01.2010 – 12.2013	**Reporting period**	06.2012
Lead executing agency	Ministry of Water and Energy		
Implementing organisation	GIZ		
Implementing partners	Ministry of Water and Energy incl. Rural Electrification Fund; Ministries of Agriculture, Health, Education and Trade; Environmental Protection Authority; Regional Governments / Bureaus of Energy, Education, Health and Agriculture; Universities / Institutes of Technology / Technical Vocational Educational and Training Units; Chamber of Commerce & Sectoral Associations; Solar Energy Development Association of Ethiopia; Ethiopian Hydropower Society; Regional (Development) Associations; private solar energy installation & maintenance companies; other private companies in the energy sector value chain (from input supply to end use); NGOs, Women's Associations. Assistance to Health System Expansion; Community Development Service Association		
Involved bilateral / multilateral programmes	Germany: Sustainable Land Management Program; Engineering Capacity Building Program, Urban Governance & Decentralisation Program; Netherlands: SNV Biogas Programme; Horn of Africa Regional Environmental Centre; Norway: Energy +; Irish Aid: Health care programme; World Bank: Energy Access and Electricity Access (Rural) Expansion; Lighting Africa; Global Partnership on Output Based Aid; Climate Investment Fund: Scaling Up Renewable Energy Programme-Ethiopia Investment Plan		

Target (number of beneficiaries)	**Target till project end**	**Achieved till 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in households	35,000	947	11,535	people
Cooking energy for households	620,000	314,323	401,190	people
Electricity and / or cooking energy for social infrastructure	450	194	268	institutions
Energy for productive use / income generation	1,000	560	1,726	SMEs

Project strategy and key components

EnDev-Ethiopia currently improves access to energy of poor households based on three types of modern energy services: a) electricity for individual households based on photovoltaic devices / systems, b) minigrids based on micro hydropower and c) energy efficient clean cookstoves. In addition, EnDev is providing electricity generated by mini hydropower or photovoltaic systems to social institutions and small enterprises as well as energy efficient cookstoves to social institutions and small enterprises.

This approach aims at establishing a market for rural electrification products through creation of demand for new products and at the same time supporting SMEs and setting quality standards for applications such as improved cookstoves and solar lanterns.

[8] plus an additional variable up-scaling of up to €1,020,000 depending on achievement of milestones

Project progress (overall progress towards outcome target EnDev 2)

Energy access has been created to 10,302 people through sales of solar home systems, lanterns and from electricity generation through micro hydropower plants. During this reporting period 74 households were connected to electricity from micro hydropower plants and a total of 541 solar home systems were sold through private retailers. After a year of intense training for potential solar retailers, for the first time the project managed to successfully promote the sale of solar lanterns. The result of a baseline study showed, that none of the retailers trained were selling lanterns before support by the project, while now 1,603 lanterns were sold. Moreover an importer who participated in the training imported for the first time in his life solar lanterns, leading to a volume of 10,000 LED lanterns distributed on behalf of UNHCR to refugee camps. Even though those lanterns only perform at 10 Lumen and do not meet the EnDev standard requirements (can thus not be counted), this development can be considered a remarkable success for the sector in the country.

In the hydropower component Gobecho I, Gobecho II, Ererte and Hagara Sodicha micro hydropower plants were completed and started being operational, and households gradually invest in connections. However, due to the low farming income situation in the region a higher connection rate is only expected after December 2012, when households earn revenues from agriculture.

From January until June 2012, a total of 50,955 stoves (30,636 Mirt and 20,319 Tikikil) were sold to households, 130 stoves were sold to social infrastructure institutions as well as 486 stoves for productive use purposes. Unlike the previous seasons, the number of Tikikil stove sales remarkably increased. Especially in Dire Dawa sales figures grew after support from the Water Mines and Energy office of the city administration for the distribution of stoves in surrounding rural woredas. Tikikil stove production also increased because various NGOs and international organisations ordered stoves in large scale from producers trained by EnDev for the distribution in refugee camps. Through this development not only the production rate but primarily also the capacity of stove producers in rural areas improved. A number of promotional activities accompanied the production and sale of stoves, as well as training in traditional charcoal production for potters in order to improve the efficiency of charcoal burning stoves.

The preparation for the equipment of 20 Health Centres with solar energy on behalf of Irish Aid has started. Moreover PV systems and charging stations have been installed for social infrastructure institutions and trainings have been implemented for community staff as well as for local private installation and maintenance companies.

The predefined milestones on project progress have been achieved and the first part of the variable budget can thus be disbursed.

Sustainability

Monitoring and supervision activities are routine activities which are done for all technologies and in all regions. Major objectives are a following up on the retailers and producers situation, support in case of problems, creating linkages with partner organisations, and controlling the quality of technologies in order to establish sustainable market standards.

Continuous efforts on optimisation and technology development is going on, for example an aluminium die component for extruder machines in the stove production with a reduced surface friction has been developed in collaboration with private metal manufacturers. Moreover an open metal oven for bread baking was constructed for testing and demonstration. Apart from that also activities to create a favourable political environment and awareness on renewable energy are carried out, such as the organisation of two informal discussion platforms 'Talk Energy Ahead (TEA)' and 'People and Energy Network (PEN)' for all actors involved in the energy sector (also government representatives).

Ghana

Promoted technology	Grid			
Project budget	EUR 1,650,000	**Spent until reporting date**	EUR 860,899	
Project period	01.2010 – 06.2014	**Reporting period**	06.2012	
Lead executing agency	Ministry of Trade and Industry			
Implementing organisation	GIZ			
Implementing partners	Ministry of Energy, District, Municipal and Metropolitan Assemblies, Local Business Associations, Regional Coordinating Councils, Environmental Protection Agency			
Involved bilateral / multilateral programmes	BMZ: Programme for Sustainable Economic Development (PSED)			
Target (number of beneficiaries)	**Target till project end**	**Achieved till 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in Households	300	382	535	people
Cooking energy for households				people
Electricity and / or cooking energy for social infrastructure	6	3	3	zones with street lights
Energy for productive use / income generation	600	157	162	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 for the industrial zones 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 for the industrial zones. The districts also provide additional infrastructure like roads, water and sanitation. The business associations contribute labour and individual enterprises pay their connection fee. It is also expected that local governments and local business associations will provide street lights at their own cost to improve security in zones. Under EnDev 2, ownership of the districts is increasingly emphasized for sustainability. The BMZ-financed PSED is supporting the interventions by promoting local and regional economic development activities around the supported zones.

Project progress (overall progress towards outcome target EnDev 2)

Until June 2012, a total of 162 SMEs (34% of all companies in the industrial zones) and 535 persons gained new access to electricity through EnDev 2 in seven industrial zones. Additional enterprises are benefitting from the overall industrial zone approach, but have had access to electricity before. Others either did not need their own connection, or could not afford their own connection, although they are sure to “borrow” electricity services from their neighbours. Three additional industrial zones were connected to the grid during the reporting period, but only one company had moved there as of June 2012. In three industrial zones street lamps have been installed. Only seven out 15 zones being supported account for the people and SMEs reported to have gained access to energy. In the remaining zones, land development is on-going and electricity networks have not yet been connected. The key task for the next reporting period is increasing the number of zones / SMEs that can be counted.

The Agona Nkwanta industrial site was connected to the grid in 2012 and enterprises started to move there. The connection of transformers at Bekwai and Agona Swedru is delayed.

ECG (the local utility) is demanding a proof of the source of purchase of the electrical hardware. EnDev-Ghana is pursuing the supplier to provide the necessary documentation. The Municipal Chief Executive (head of local government) has been involved to seek a political solution with ECG.

In Bekwai, weak business association structures and lack of interest by the local government still slow down the progress. As a mitigation measure, the project has introduced a closer follow up on local level to promote dialogue between the local stakeholders. Goaso recorded a decrease in enterprises and employment in SMEs with electricity. Enterprises are not interested in relocating because the site can accommodate only a few more enterprises. The solution will be to establish a larger site in addition.

In Kenyase, five additional companies were recorded. Relocation of enterprises to the site is however slow because enterprises fear theft. The light industrial area at Bechem has seen an increase in enterprises and employees with new electricity connection was recorded. In Berekum industrial area, the number of employees at the site has temporarily declined. Some of the artisans are engaging in farming activities during the planting season. Techiman light industrial area has experienced continued growth. Seven new companies and 40 new jobs were recorded. A further 20 enterprises are building their shops and will relocate soon.

The EnDev 2 zones are developing at a good pace. Electrical installations have been completed at Axim, Sefwi Wiawso, Dormaa and Enchi. Plot allocations have been done in Dormaa and Enchi. Installations in Kumasi are about 70% completed. The electricity hardware has been delivered on time in Suhum and Nsuaem.

The use of district economic development forums continues its roll-out. The Profitable Environmental Management (PREMA) programme is accelerating. It is also planned to implement a pilot scheme to improve household waste collection and disposal, as well as a simple scheme to improve the management of used oil and wood waste as a follow up to PREMA trainings in two zones.

Sustainability

The development of industrial areas has become part of national strategies for economic development. A Draft National Policy for Local Economic Development is being finalised and a National Local Economic Development Technical Committee has been established with GIZ representation. The Rural Enterprise Project III co-financed by IFAD and AfDB has adopted the broader concept of Light Industrial Area Development as key requirement for the provision of Rural Technology Facilities (RTF). These facilities are equipped with “state of the art” metal work machines for providing specialised services to enterprises in the zone. RTFs have been constructed at Bechem Industrial Zone and Nsuaem Industrial Zone, another one was established at Bekwai before the EnDev Intervention. The presence of RTFs makes the zones more attractive to enterprises and enhances the quality of their outputs.

The major costs for developing the industrial zones are now borne by the local governments and the private sector. The EnDev contribution mainly consists of catalyst funding and advisory services. EnDev-Ghana has planned experience sharing platforms at the regional level and will train local MSME sub-committees to enhance public private dialogue.

Further information

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

Honduras

Promoted technology	PV Systems, Stoves, Micro Hydropower and Grid Extension		
Project budget	EUR 4,130,000	**Spent until reporting date**	EUR 2,230,755
Project period	10.2009 – 12.2014	**Reporting period**	06.2012
Lead executing agency	Instituto de Conservación y Desarrollo Forestal (ICF)		
Implementing organisation	GIZ		
Implementing partners	Communities, NGOs		
Involved bilateral / multilateral programmes	Natural Resources and Economic Development Programme (BMZ)		

Target (number of beneficiaries)	**Target till project end**	**Achieved till 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in Households	14,000	12,994	15,953	people
Cooking energy for households	15,300	17,595	24,135	people
Electricity and / or cooking energy for social infrastructure	150	121	124	institutions
Energy for productive use / income generation	50	162	162	SMEs

Project strategy and key components

EnDev-Honduras is working with local NGOs, local governments and community development programs under co-financing arrangements between EnDev, partner organisations and beneficiaries. Partners have to be present in the communities. The energy issue is integrated into rural development processes and agricultural and forestry production. A network of partner organisations is created that allows successful implementation of the EnDev activities. Partners are encouraging the formation of local management entities which are trained in technologies, organisation and management to support the beneficiaries in maintenance and repair of the energy systems.

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

Project progress (overall progress towards outcome target EnDev 2)

Until end of June 2012 a total of 40,089 persons have benefited during EnDev 2:

- Five grid extension projects with local governments, community organisations and beneficiaries connected 477 households (2,527 persons).
- Solar home systems have been installed in 2,140 households, benefiting 12,315 persons.
- 58 schools, eight health centres and 48 communal centres gained access to electricity with photovoltaic systems.
- Two pico Hydro Projects have provided three households with electricity, benefiting 17 persons. One communal centre also gained access to electricity with one of these projects.
- In 4,600 households improved “Justa” stoves were installed providing 24,135 persons access to healthier cooking facilities.

- Justa Stoves were built in nine schools allowing children access to school meals.
- Seven organisations of coffee producers gained access to electricity with photovoltaic systems.
- Solar coffee dryers were installed for 154 cooperatives with a total of 1,292 organized producers.
- An oven for indigenous pottery was installed for one indigenous cooperative.

PV for households

With the partner organisation, “Hermandad de Honduras”, 338 additional solar home systems of 30 Wp were installed for 1,848 persons in various communities pertaining to six departments of the country. One school and one community centre were also electrified by solar systems.

Micro hydropower

During the first semester of 2012, the first two pico Hydro Projects were designed and installed in two different communities. Locally acquired pumps were used as turbines, and induction motors were used as generators. The installed capacities of these two projects are: 85 and 300 Watts. With these two projects, 3 households and 1 community centre were connected, benefiting a total of 17 persons with electricity in their households. EnDev-Honduras aims to promote these projects with the partner organisation “Honduran Association of Coffee Producers” (AHPROCAFÉ).

A bidding process for the purchase of pipes and accessories for a 100 kW hydropower project in San Antonio, Yure was held. This project was financed by the local communities, the “National Development Program” (PRONADERS), and the “National Electric Energy Company” (ENEE), both governmental counterparts. A total of 246 houses were connected, benefiting a total of 1,095 persons.

Improved cookstoves

In a contract with the partner organisation AHDESA, 1,200 “Justa” stoves were constructed in various communities, in equal number of households, benefiting 6,540 persons.

Productive use

No new projects for productive uses are reported for the first semester of 2012.

Sustainability

The sustainability strategy of EnDev-Honduras is based on three pillars:

- Active participation of community organisations in the development of the activities.
- Co-financing mechanisms, involving beneficiaries own contributions of up to 50% of total costs, participatory promotion by local NGOs, and local implementation alliances linking the key public and private actors.
- Capacity development of the partners for the management of technologies, administrative controlling and technical project backstopping and supervision based on an assessment of local needs and dynamics for human development.

These activities are currently being coordinated by the partner institution, the “National School of Forestry Sciences” (ESNACIFOR). A Training Program including courses for the installation, operation and maintenance of photovoltaic systems, construction of improved cookstoves, development of micro hydro sites and the construction of solar coffee dryers, is currently under way.

Further information

By the end of 2012 an impact study will have been completed.

Kenya

Promoted technology	Solar / Stoves		
Project budget	EUR 6,800,000[9]	**Spent until reporting date**	EUR 3,228,225
Project period	06.2009 – 12.2014	**Reporting period**	06.2012
Lead executing agency	Ministry of Agriculture		
Implementing organisation	GIZ / SNV		
Implementing partners	Ministry of Energy, Ministry of Education, NGOs, Private sector players, church organisations		
Involved bilateral / multilateral programmes	BMZ: Promotion of Private Sector Development in Agriculture (PSDA), GEF: Renewable Energy Technology Assistance Programme (RETAP); Programmes and Projects of World Bank, DFID, UNDP, WPF, Practical Action, UNHCR, SNV, WFP, USAID Programme – Aphia Plus, GIZ Water Programme, German Red Cross, German Agro Action, British American Tobacco, Alliance One		

Target (number of beneficiaries)	**Target till project end**	**Achieved till 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in households	40,000	0	0	people
Cooking energy for households	3,730,000	2,928,669	3,352,755	people
Electricity and / or cooking energy for social infrastructure	350	97	97	institutions
Energy for productive use / income generation	140	242	242	SMEs

Project strategy and key components

EnDev-Kenya remains focused on strengthening the role of the private sector in dissemination of improved cookstoves activities. EnDev's efforts in supporting a bigger number of stakeholders to include stove activities in their core business are bearing fruits. Hereby EnDev plays a key role in capacity building to ensure continuity and adaptation of similar approaches within other stakeholder organisations and thus reaching out to more areas. EnDev-Kenya is taking a lead in the country to support interested partners to mainstream stove activity in their work.

The purely commercial strategy has supported stove adoption and sales and has thus contributed to job creation and income generation. Stove production and installation is an important income-generating activity for involved households.

The main interventions remain focussed on scaling up of promotion, production / construction and use of ICS in households. This is accompanied by consumer-level awareness creation about the characteristics and proper use of improved cookstoves. Furthermore, there are interventions to ensure sustainability of stove production and quality control mechanisms.

In 2012, EnDev-Kenya became active in new districts to increase the outreach of the project.

Activities to promote ICS for social institutions and SMEs are currently implemented only as a side activity. The project focus is mainly on stoves for households.

The project has included promotion of solar lanterns since May 2012. Again, commercialization is a key factor for success. Preparation activities are carried out to ensure proper market

[9] plus an additional variable up-scaling of up to €1,000,000 depending on achievement of milestones

launch of these new products. EnDev will work in close collaboration with SNV to implement pico PV systems at field level.

Project progress (overall progress towards outcome target EnDev 2)

At household level the project is ahead of the target having supplied already more than 3,350,000 people with access to modern cooking energy.

The project moves to new areas to stimulate new markets and partners with more stakeholders. Two examples should be mentioned in this report: The collaboration with tea factories, the Kenya Tea Development Authority, has expanded significantly and has made stove activities a part of their environment conservation efforts.

The partnership with the NGO “APHIA Plus”, has enabled the project to reach a target group which would otherwise be left out: mainly people in the communities who care for orphans and vulnerable children. Through the stove work the target group gets a little income to help them take care of the orphans and vulnerable. This has made a very significant impact in APHIA Plus work and there is already an initiative to have the stove work extended to all other regions where they are active.

Social institutions are still recording a notable slow uptake of ICS. One challenge remains that public institutions are generally underfunded and decision making processes are long. In the last six months a total of 205 institutions have acquired 3,581 ICS. The response from the sector is not matching expectations. One option being pursued now is getting desk officers from the ministry of education to carry out awareness campaigns and also to lobby for funding especially for government schools, prisons and health institutions. SI are mainly reached on a one on one basis. An approach from policy level is being considered whereby it would be mandatory for these institutions to have improved cookstoves.

ICS for productive use help to save on production costs, mainly by hotels and small cooking businesses. Between January and June 116 enterprises have acquired a total of 223 stoves with 1,598 people making a living out of these businesses.

Sustainability

EnDev-Kenya is making efforts to focus on interventions which can lead to sustainability and continuation of stove promotion beyond the project phase. Income generation has become a major motivation for players to continue in ICS promotion. Between January and June the stove builders and installers in Kenya supported by EnDev generated an income of more than EUR 500,000 through their stove work.

Capacity development at local level ensures service availability close to the clients. This includes user awareness, cooperation with local organisations and government local offices.

The support and coaching of the Improved Stove Association Kenya (ISAK) continues, resulting in mobilisation of members, take up of quality control, training of producers, awareness raising, elaboration of a code of conduct, lobby work, etc. The establishment of a professional stove testing centre in Kenya is being pursued.

Commercialization is a key factor; the project continues to communicate to all cooperation partners the high relevance of a commercial approach. ISAK will play a key role in protecting the interests of its members in this respect.

Further information

EnDev-Kenya has played a big role in supporting the Global Alliance for Clean Cookstoves launch in Kenya through a workshop. GIZ and SNV have been nominated as Coordinating Partners to coordinate the consultation process in Kenya to finalize the Country Action Plan which is expected to clearly articulate issues and make convincing propositions for further action by GACC.

Liberia

Promoted technology	Solar / Biogas / Stoves / Hydro		
Project budget	EUR 750,000[10]	**Spent until reporting date**	EUR 6,746
Project period	05.2012–12.2013	**Reporting period**	06.2012
Lead executing agency	Ministry of Lands, Mines and Energy		
Implementing organisation	GIZ		
Implementing partners	Rural Renewable Energy Agency, GIZ Development Oriented Emergency and Transitional Aid in Lofa, Agro Action (Welthungerhilfe), Lighting Africa		
Involved bilateral / multilateral programmes	GIZ program "Development Oriented Emergency and Transitional Aid (DOETA); 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 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in Households	5,500			people
Cooking energy for households	5,000			people
Electricity and / or cooking energy for social infrastructure	10			institutions
Energy for productive use / income generation	150			SMEs

Project strategy and key components

The implementation of the EnDev activities in Liberia has only been approved in April 2012 and focuses on the five components elaborated in the following.

Approach to provide electricity to households

EnDev supports the development of a market for pico PV products based on local sales agents, shops and outdoor markets. Partners are the solar retailers participating in the Lighting Africa program, the GIZ "Development Oriented Emergency and Transitional Aid" program with its local partner organisations, SOS Children's Villages Worldwide and possibly also Agro Action (Welthungerhilfe) and Total.

Minigrids

EnDev supports the installation of one pilot minigrid up to a size of 100 kW. The technical options to be evaluated are minigrids based on hydropower and PV / Diesel hybrid systems.

Approach to provide clean cooking technologies to households (improved charcoal stoves)

EnDev will initially import some charcoal stoves that are successfully disseminated in other African countries. The stoves will be offered to local retailers for marketing. Assuming that the demand is sufficient, first local craftsmen shall be trained in the production of the most

[10] plus an additional variable up-scaling of up to €240,000 depending on achievement of milestones

accepted stoves. In parallel, a marketing campaign will be carried out to create awareness among the households about advantages of modern stoves.

Approach to provide access to modern energy services for social institutions

SHS for schools and other social institutions shall preferably be installed in combination with battery charging stations or solar kiosks that offer charging services to the community. As a first pilot activity, EnDev provides advice to the modernisation of the energy supply for SOS Children's Village locations. These shall be renovated based on renewable energy, also considering connecting nearby households.

Approach to provide access to modern energy services to SME's (solar dryers)

EnDev supports the dissemination of solar cocoa bean dryers for agricultural products for small and medium enterprises in close cooperation with the GIZ program "Development Oriented Emergency and Transitional Aid". Pilot activities are implemented together with local farmer cooperatives in the Foya district in Lofa county.

Project progress (overall progress towards outcome target EnDev 2)

Since the first project phase has only started about two months prior to the end of the reporting period, the project has only started to prepare very first pilot activities.

Initial preparations have started on activities in the field of market development for pico PV products in Foya district, Lofa county, as well as on the construction of different solar cocoa bean dryer models to be tested in the same county.

With regard to clean cooking technologies for households it cannot be expected that these cooking technologies will disseminate quickly because people in the rural areas face no serious lack of firewood. They generally cook outside their huts, so that indoor air pollution is not a severe health problem. Thus there is probably only limited motivation to shift to a clean-burning stove. Prices for charcoal are relatively low so that for urban households, too, there is no strong incentive to buy energy efficient stoves. The challenge will be to create sufficient awareness among consumers to understand and appreciate the benefits of improved cookstoves.

Sustainability

Since the project is only at a very initial state of implementation, a handover strategy has not yet been defined. The sustainability of the project activities shall be attained by working through existing structures and by including capacity building activities for example project management including monitoring of progress and impacts.

Further information

As an incentive for commitment towards implementation of the project activities, the overall budget will increase by an additional variable budget of up to EUR 240,000, depending on the achievement of predefined milestones.

Indonesia

Promoted technology	Hydro		
Project budget	EUR 9,000,000	**Spent until reporting date**	EUR 5,987,383
Project period	05.2009 – 06.2014	**Reporting period**	06.2012
Lead executing agency	MHP-TSU: Ministry of Home Affairs (MoHA), MHPP²: Ministry of Energy and Mineral Resources (MEMR)		
Implementing organisation	GIZ		
Implementing partners	Program Nasional Pemberdayaan Masyarakat (PNPM), Operation Wallace Trust		
Involved bilateral / multilateral programmes	Worldbank Multi-Donor Trust Fund, Indonesian-Dutch Energy Working Group / RE Programme		

Target (number of beneficiaries)	**Target till project end**	**Achieved till 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in Households	112,000	9,930	18,464	people
Cooking energy for households				people
Electricity and / or cooking energy for social infrastructure	200	52	145	institutions
Energy for productive use / income generation	340	0	30	SMEs

Project strategy and key components

EnDev 2 Indonesia aims to support sustainable rural off-grid electrification, mainly through micro hydropower (MHP). The project comprises two components: (1) The PNPM Micro Hydropower Technical Support Unit (MHP-TSU), and (2) the Mini Hydropower Project (MHPP²). Of the two, MHP-TSU provides technical support to the Government of Indonesia's community empowerment program Green-PNPM, where a World Bank Multi Donor Trust Fund has earmarked investment budgets for MHP in 8 provinces in Sumatra and Sulawesi. The project aims to a) safeguard sustainability of the community-owned MHP schemes under Green-PNPM, b) build capacity for and integrate sustainable project development and implementation into the Green-PNPM system and the involved MHP sector, and c) connect up to 112,000 people through 140-150 off-grid MHP schemes. The Green-PNPM pilot will be closed by the end of 2012; remaining activities of TSU will be integrated into the MHPP^2 component. The MHPP² component aims to institutionalize knowledge and experience on the development of sustainable off-grid MHP schemes in the Indonesian sector, especially from TSU, with the Directorate General for New and Renewable Energy and Energy Efficiency (DG NREEC) in the Ministry of Energy and Mineral Resources as the main counterpart, via the analysis and dissemination of best practices. Through strengthening this Directorate General's capacity EnDev aims to support the integration of sustainability safeguards in all government MHP investments. Under an already approved upscaling MHPP^2 will also support DG NREEC in the installation of village PV minigrids providing similar sustainability safeguarding contributions as TSU. Support for rehabilitation of broken down MHP schemes is also considered.

Project progress (overall progress towards outcome target EnDev 2)

In this reporting phase a total of 48 MHP sites can be reported. These sites represent a total of 24,618 potential beneficiaries. In reality the potential number will not or not immediately be reached for various reasons. In September 2012 a post commissioning survey will provide

clarity. Meanwhile conservatively only 75% of the potential is reported. 88 MHP sites (60,000 beneficiaries) are still under construction and receive continuous MHP-TSU support. Most of these will be finalized by end 2012. More than 50% of the target for social institutions has meanwhile been already achieved and it is likely that this objective will be overachieved until project end. MHPP² has recruited two NGOs in Sumatra and Sulawesi respectively to undertake a productive use pilot project. A total of 100 electrical appliances for 40 businesses in nine villages will be provided and the financial performance of the businesses monitored. A database currently contains about 40 different productive use options. The project is investigating the potential for grid feed-in at selected MHP sites, to strengthen sustainability by providing excess electricity to a continuous off-taker. An initial assessment was concluded in March 2012 and will be refined for submission to the target community and the national utility PLN.

MHPP² is furthermore investigating monitoring and evaluation mechanisms that would allow for the regular recording and analysis of the performance of MHP schemes. This initially includes training of operators on manual record keeping, supported by a suitable data transfer mechanism. For the latter an SMS-based data gateway is currently being investigated. Energy meters (measuring kWh produced) and time meters (registering operating hours) will be installed at a total of 67 MHP by end August 2012.

Training materials on MHP technology, developed by MHPP^2, have been fully integrated into the training programmes of the Hydro Power Competency Centre (HYCOM), Bandung. A host training institution for MHP administration and management has not been identified yet, but a training-of-trainers programme amongst rural development NGOs will be launched during the next reporting period. In addition, a training programme on MHP commissioning procedures is near completion. A pilot training course was conducted in May 2012 at HYCOM.

Sustainability

At the project (village) level, the technical assistance provided by MHP-TSU focuses on the construction of good quality, community owned and institutionally sound operated and managed MHP schemes. On the program level, many critical lessons from the (MHP-TSU) field are being documented, analyzed, and incorporated into a toolbox. The main focus of MHPP² is:

(1) Strengthen the capacity of the DG NREEC to assume, carry out and supervise the tasks and responsibilities linked to the development and / or rehabilitation of sustainable off-grid MHP and other renewable energy schemes for rural electrification. Through DG NREEC the awareness of the other key players in the sector will be raised. Direct handing over to MoHA is no longer considered feasible since rural electrification is not and will not become a core function of MoHA. However the Green PNPM field staff that was capacitated in hydropower by MHP-TSU will be absorbed by PNPM rural and will use this knowledge to strengthen the sustainability (technical and institutional) of the still ongoing PNPM rural MHP projects.

(2) With and through DG NREEC and the developed toolbox, develop or strengthen the institutional capacity of Indonesian stakeholders for renewable energy based rural electrification (mainly MHP) as a whole. This would include key stakeholders such as associations, contractors, consultants and training institutions.

Further information

- endev-indonesia.or.id
- mhpp2.or.id
- tsu.or.id

Mali

Promoted technology	Solar PV for battery charging stations and social infrastructure		
Project budget	EUR 2,000,000	**Spent until reporting date**	EUR 1,949,321
Project period	04.2009 – 06.2013	**Reporting period**	06.2012
Lead executing agency	Ministère de l' Administration Territoriale et des Collectives Locales (MATCL)		
Implementing organisation	GIZ		
Implementing partners	Direction Nationale de Collectivités Territoriales (DNCT) ; Agence Malienne pour le Développement de l'Energie Domestique et de l´Electrification Rurale (AMADER)		
Involved bilateral / multilateral programmes	Programme Promotion of Local Government (PACT)		

Target (number of beneficiaries)	**Target till project end**	**Achieved till 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in Households	19,800	4,768	6,831	people
Cooking energy for households				people
Electricity and / or cooking energy for social infrastructure	180	106	108	institutions
Energy for productive use / income generation				SMEs

Project strategy and key components

The EnDev strategy is to guarantee sustainable provision of electricity to rural private households by PV-driven communal battery charging stations (BCSs) and to rural social infrastructure by SHS. In addition, installation of one solar-diesel hybrid minigrid is foreseen.

The BCSs become the property of the commune. They are operated on fee-for-service basis and are contracted to private service providers who are also responsible for O&M of SHSs in SI. A fixed percentage of the BCS revenues and part of the fees charged for communal services are deposited into a fund to cover costs for repair and replacement. Key interventions are:

- Identification of rural communes that comply with EnDev criteria and good governance criteria and that have the capacity to contribute financially; subsequent selection of a few villages in the selected commune to be supplied with PV installations.
- Set-up of an institutional framework by agreement on (1) management committee selection; (2) assignment of duties / rights to operator / committee (3) stakeholder supervision.
- Training for (1) communal staff and management committee on tasks as owner and supervisory body; (2) service providers on O&M of PV systems and business tools.
- Financing of installation of solar PV systems for electrification of schools, health centres, town halls, solar street lights and BCSs (community contribution 10 - 20%).
- Technical and managerial coaching / backstopping for institutions and operators; integration of public energy services concept in communal development plans.

Project progress (overall progress towards outcome target EnDev 2)

With hardware installation completed in all but one of the targeted villages by the end of 2011, activities in this semester focussed on coaching and backstopping and on making EL-

COM 2 results more sustainable. Results in previous semesters showed that BCSs so far are not sufficiently used, thus not generating enough income to properly maintain installations. A consultancy was done late 2011 to investigate underlying causes, resulting in a detailed overview of appropriate actions per BCS in order to boost usage and improve management. Suggested actions a.o. entailed:

- Set up of a battery leasing system to remedy the shortage of (good quality) batteries.
- Actions to stimulate activity at BCSs, turning them into 'energy shops'. In addition to battery charging e.g. phone charging and hairdressing (electric trimmers) could be provided. Also small electrical devices might be sold, boosting electricity demand. Part of the revenues generated by new services will be deposited into the repair fund.
- Specific actions targeted at individual BCSs in order to improve management.

13 BCSs were equipped with data loggers so as to track suspected underreporting, bringing their total to 15. Assuming that data loggers yield reliable information, results show that in some BCSs underreporting up to 80% is occurring while also apparent 'over reporting' was noted, possibly the result of batteries not being fully charged. Both issues need investigation. Data loggers were installed early this year, data collection became difficult after the putsch. Therefore in most of the 15 BCSs only 2-3 months of data were available. This is insufficient to justify overall reporting on basis of the data loggers, apart from the fact that only 15 out of 50 BCSs are equipped with data loggers so far. Reporting for the 15 BCSs concerned based on data logging is foreseen for 2012-2. Discrepancies between registered numbers of batteries and data logging results so far justify installation of data loggers in all BCSs.

The BCS in the last remaining commune was completed. Data from this commune are not yet incorporated as recent completion yielded too little data for a reliable indication of the outcome. Installation of the minigrid was started but not completed due to the putsch.

Windfall gain and double energy factor in this project are negligible. Like before a 50% replacement rate is applied, even though savings into the repair fund are below 50% of the level that should have been attained.

Sustainability

As in the last semester, BCSs are frequented at strongly varying intensities, now ranging from 22-64%, averaging 36% of the frequentation required needed to ensure economic viability at community level. Average frequentation (in terms of percentage of the maximum possible) of BCSs in 2012-2 at 25% is slightly down from 2011-2 (27%). While the latter might be caused by seasonal influences, the relatively large changes in (reported) frequentation in some individual BCSs need investigating.

Accurate data logging would provide more insight in underlying causes which could then be better addressed. Various interventions are already suggested to improve BCS frequentation hence sustainability; however such actions have been halted / delayed following the putsch.

BSCs in itself are operated independently from the project and can continue without project interventions, though some handover activities should still be done.

Options for autonomous up-scaling beyond the project boundary are limited. Initial investment costs are high and largely subsidised. As setting up the fund for maintenance and repair al-ready proves difficult, excess funds for upscaling in this set up are unlikely.

Considering the above and the political unrest in Mali, a modest additional proposal will be prepared, entailing installation of the minigrid as foreseen, installation of data loggers in all remaining BCSs, and implementation of actions to improve sustainability of operations. Also handover of follow up of activities to third parties will be studied.

Further information

Further information can be found in the up-scaling proposal.

Mozambique

Promoted technology	Solar, Hydro, Grid		
Project budget	EUR 3,800,000	**Spent until reporting date**	EUR 3,367,544
Project period	01.2010 – 12.2012	**Reporting period**	06.2012
Lead executing agency	Ministry of Energy		
Implementing organisation	GIZ		
Implementing partners	Electricidade de Moçambique (EdM), Fundo de Energia (FUNAE), Direcções Provinciais de Energia (DIPREME), MFIs, NGOs and private enterprises		
Involved bilateral / multilateral 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 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in Households	45,600	42,398	42,145	people
Cooking energy for households	n/a	n/a	n/a	people
Electricity and / or cooking energy for social infrastructure	26	3	30	institutions
Energy for productive use / income generation	203	60	97	SMEs

Project strategy and key components

EnDev-Mozambique is supporting grid densification, pico and mini hydropower plants on community level and the training of local SMEs doing business with PV systems. Activities in the field of improved cookstoves for the next phase are currently being planned. In the grid component, EnDev financed the grid connection of additional poor households in already electrified areas based on prepaid meters. The grid activities of EnDev-Mozambique were carried out by the national electricity utility EdM, which has received a financing contract from EnDev for this purpose. This component has been successfully concluded. Grid densification will be continued in the next up-scaling. In the field of hydropower, EnDev is currently working on implementing a commercial operator model in which the operator obtains financing for the hydropower plant and related productive use installations. This financing is expected to come from local banks or FUNAE. EnDev contributes to the project by financing the electricity grid which transmits electricity produced by the hydropower plant to village households and shops. The project interventions in the solar PV components aim at working with private sector partners that purchase, own and sell material. Local importers, wholesalers and retailers of PV products receive training on technical and quality aspects of PV systems as well as training on sales promotion, marketing and customer service. Importers are advised on how to identify and where to source quality PV products. EnDev-Mozambique establishes linkages in the market between importers of quality PV products offering guarantees and (potential) retailers. Awareness raising campaigns increase the customers' knowledge on PV products.

Project progress (overall progress towards outcome target EnDev 2)

Hydro

The progress in the hydropower component with the NGO AKSM has improved in the first half of 2012, but is still not up to required levels. There are now nine sites operational in total.

These sites have a total installed capacity of 246.4 kW and serve 339 households, 39 social institutions and public lighting systems and 97 small enterprises (EnDev 1 and EnDev 2 sites combined). The cooperation progress with FUNAE in the micro hydro sector is stagnating. Efforts to establish a loan scheme have stranded for mainly bureaucratic obstacles within FUNAE, despite constructive inputs from the Belgian BTC's resident advisors. Main obstacles are the ownership of the power plants and acquisition procedures. While the progress with the state fund FUNAE is stalled, new financing options through the commercial banking sector look more promising. KfW and the French AfD have a pronounced interest to work in the sector through national banks. These schemes are being elaborated but will take some months more to be established. The talks with banks and FUNAE continue in the second half of 2012. A positive development has been the establishment of a FUNAE office close to the EnDev office in Chimoio, Manica province. Movements into their proper role in the province are noticed but professionally it is still well below required performance. AMES-M in Chimoio takes an active role in this. The ToR for the Chimoio Excellence Centre Hydro Department (ECHD) have been discussed with the main partners and received their principal support.

Solar

Two team members of the former NGO SolarMoz have joined EnDev-Mozambique in January 2012, based on SolarMoz' positive performance. EnDev-Mozambique is now continuing this work. Around 40 enterprises and PV sales outlets are now cooperating with EnDev-Mozambique. A solid monitoring system for quality and quantity of sold solar systems has been developed. 240 staff members of the sales outlets have been trained. The first half year's results are promising with an accountable output of over 3,000 people reached. The efforts undertaken under the PPP with the Hochschule Ulm lead to the establishment of a small company that has started assembling and selling the well-received Fosera standalone pico PV systems. The additional outcomes are not yet counted, because Lighting Africa certification of Fosera's products is still pending. As an offspring of the PPP, a solar equipment test facility has been established at the Eduardo Mondlane University in Maputo. In order to upscale the sales volume of its partners, AMES-M is in discussion with major supermarket chains about integrating solar PV products in their product portfolio. Thanks to some lobbying efforts of AMES-M, FUNAE has finally shown interest in selling products of AMES-M partner companies via their network of gas stations. AMES-M is still discussing this possibility with FUNAE in more detail. A solar training centre has been established with EnDev support at the Instituto Industrial de Maputo (IIM). It has been inaugurated in July 2012 and is now available for training programmes carried out by the institute and other parties. Belgian technical cooperation is planning to fund a larger training programme for FUNAE staff, using the training centre at the IIM.

Sustainability

The positive conclusions of the impact study on grid densification in Matola and Maputo outskirts invites to consider the use of up-scaling funds for a new contract with EdM for similar grid densification activities in the coming years. It is EnDev-Mozambique's conviction that the chosen strategy has sufficient security built in for sustained development of the energy sector. The intensive cooperation with main actors such as FUNAE and World Bank, the involvement of the educational infrastructure (knowledge / advisory base) as well as a specifically capacitated private sector, local banks and NGOs on both community development and implementation level, guarantees a sustained capacity / knowledge base in the country. The strategy of AMES-M for the coming three years will aim at transferring a good part of the project's role to the local knowledge centres in Chimoio for the hydro sector and in Maputo for the solar sector, by 2015. These units, established with the universities and colleges, should, by preference, be operated partly on a commercial basis.

Nepal

Promoted technology	Hydro / Grid			
Project budget	EUR 2,640,000	**Spent until reporting date**	EUR 890,598	
Project period	05.2009 – 12.2013	**Reporting period**	06.2012	
Lead executing agency	Ministry of Energy (MoE)			
Implementing organisation	GIZ			
Implementing partners	a) Grid Extension: Nepal Electricity Authority (NEA) b) Hydro: Alternative Energy Promotion Centre (AEPC)			
Involved bilateral / multilateral 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 (Netherlands), HELVETAS			
Target (number of beneficiaries)	**Target till project end**	**Achieved till 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in households	141,177	85,345	134,335	people
Cooking energy for households				people
Electricity and / or cooking energy for social infrastructure	33	192	220	institutions
Energy for productive use / income generation	40	260	357	SMEs

Project strategy and key components

EnDev-Nepal consists of two components providing electricity to rural communities: The first component supports the national Rural Electrification Programme implemented by the national utility (NEA) for grid extension to communities. EnDev had a meanwhile finalized 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 productive use of electricity has been supported by previous awareness campaigns and intensive business promotion activities in cooperation with Helvetas. The second component supports the efforts of remote communities to be electrified by micro hydropower plants via a micro hydropower debt fund enabling them to pay the high upfront costs over a long period of time and encouraging commercial banks to finance projects in the rural energy sector. This component has been scaled up by additional EnDev funding of EUR 1.0 million provided by the Norwegian Ministry of Foreign Affairs. It is completely integrated into the new single-modality National Rural and Renewable Energy Programme (NRREP) for the energy sector of Nepal which is in implementation since mid-July 2012. EnDev has taken part in the preparation of this plan alongside other development partners.

Project progress (overall progress towards outcome target EnDev 2)

Grid Extension

The grid extension component has accelerated its progress in the first half of 2012 and exceeded its original target by far. Households have been electrified in 28 communities and construction is in progress in further 21 communities. EnDev-Nepal focused its efforts on acceleration of the construction activities by facilitation between NEA officials, regional NEA offices and community representatives. Through these efforts as well as a new regulation

permitting CREE to construct distribution grids independently without external contractors it was possible to speed up the electrification process. As a result, 133,361 persons were provided with electricity exceeding the original project target in this component (115,062 persons) substantially and ahead of schedule. Besides households, 220 social institutions were connected, mainly schools, health posts and local administration. In addition, 357 rural businesses are currently supplied, mainly rice or maize mills, and poultry farms and carpentry. The cooperation on business promotion has moved forward and the planning documents for a 2-year project on productive use of electricity has been finalised. Hereby, EnDev promotes enterprise development and employment generation by training local persons with a business affinity, e.g. small traders, craftsmen, shop keepers etc., for a period of about a year in various entrepreneurial skills based on service provision (e.g. communication centre, electric repair) and agricultural processing (e.g. milk cooling and dairy, coffee processing, juice extracting).

Hydropower

The first MHP plant under the Micro Hydro Debt Fund is meanwhile completely finalised and has connected 974 persons (177 HH) to a minigrid. The two commercial partner banks (Himalayan Bank and Clean Energy Development Bank) which act as fund managers have altogether received 28 applications for MHP User Committees ranging from 12 to 100 kW. Out of these 10 loan agreements for MHP plants have been signed with an installed capacity of 403 kW, covering 3,976 HH (21,868 persons) and total credit value of EUR 215,000 up to now. The banks have completed many inspection visits of existing micro hydropower sites in eight districts to decide about lending to rural communities, and have appointed focal persons in their credit departments to assess projects bankability. As a result, the banks are starting to build up knowledge in rural financing of energy projects. The MHP Debt Fund has received substantial interest by other development partners as the new NRREP will move more and more from a subsidy to a credit based financing in rural electrification.

Sustainability

Grid Extension

The role of branch organisation NACEUN is crucial, reason for continued EnDev support. Despite its small financial and also personal resources it has been accepted by NEA's central office as a partner for community electrification and can continue to lobby and monitor on behalf of the CREE even when the project will phase out. As the communities have also invested quite considerable own funding, they will follow up closely that the electrification is carried out as agreed. Experience shows that if they complete the complicated electrification process, they gained considerable skills in dealing with government institutions, local authorities and private companies giving them knowledge and confidence in managing their distribution grid as well as other community projects outside electrification.

Hydropower

A major part of the concept is to support the private sector to be able and to have confidence to invest in micro hydropower and show that even in rural areas it can be a profitable business. Once microfinance institutions and banks have gained experience with MHP lending, it can be expected that they will appraise proposals and provide credit on their own. On an institutional side AEPC might be shifted from the Ministry of Environment, Science and Technology, to the Ministry of Energy, just as NEA is, creating additional potential for sustainability in terms of energy planning, coordination between centralised and decentralised energy sector and making it easier for decentralised MHP to feed in into the grid. As a result, it would increase their financial sustainability and attractiveness for banks to invest.

Further information

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

Nicaragua

Promoted technology	Solar / Hydro / Grid			
Project budget	EUR 4,141,000	**Spent until reporting date**	EUR 2,034,572	
Project period	06.2009 – 12.2014	**Reporting period**	06.2012	
Lead executing agency	Ministerio de Energía y Minas (MEM)			
Implementing organisation	GIZ			
Implementing partners	MEM, NGOs, communities, private enterprises			
Involved bilateral / multilateral programmes	Sustainable Management of Natural Resources and Strengthening of Entrepreneurial Competencies (BMZ)			
Target (number of beneficiaries)	**Target till project end**	**Achieved till 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in Households	29,000	26,323	27,025	people
Cooking energy for households				people
Electricity and / or cooking energy for social infrastructure	110	48	48	institutions
Energy for productive use / income generation	115	71	72	SMEs

Project strategy and key components

EnDev is implementing its activities in close cooperation with the Ministry of Energy and Mines (MEM). MEM coordinates donor activities within the national energy sector and is the major partner in planning and technical supervision of hydropower and national grid connected activities. Individual project implementation throughout Nicaragua is accomplished by linking actors such as NGOs, local governments and private enterprises with local communities or cooperatives under cost sharing agreements. Partner organisations are trained in technical and organisational aspects for awareness building and capacity development. The key components of the rural electrification activities are the installation and maintenance of renewable energy systems, such as solar home systems and micro or small hydropower plants. Grid densification and extension is pursued in cooperation with MEM and the distribution utilities ENEL and DISNORTE / SUR.

Project progress (overall progress towards outcome target EnDev 2)

A total of 27,025 persons, 48 social institutions and 72 small and medium enterprises have been electrified during EnDev2 until the end of June 2012.

PV for households

In the reporting period 121 additional households (702 persons) have been provided with solar home systems of 85 Wp for household lighting and basic domestic energy applications as radio, TV / DVD and cell phone charging.

The subsidy rate for the families has been slightly increased because of increased battery prices due to a temporary lead shortage on the world market.

The results of the sustainability study implemented by the Central American University (UCA) have been the basis for planning and designing a battery renewal and recycling campaign. However, it seems that in the meantime most of the families have already changed their batteries on their own behalf without intervention by the project and the demand for additional batteries seems to be very low.

In order to improve the local technical support structures in the villages a course on PV and solar home system installation and maintenance was implemented by a joint venture of the local solar provider SUNISOLAR and the National University of Engineering (UNI). Selected participants from the communities EnDev had provided with access to the technology were trained in the maintenance of Solar Home Systems. The participants were provided with basic tool sets which partially had to be purchased by them. In a second stage practical diagnostic solar home system checks will be implemented with these local technicians in the communities and batteries and other parts will be replaced by them against a fee paid by the owners of the systems and a commission paid by the solar provider for the necessary spare parts. The owners of the solar home systems have to cover the costs for the spare parts, such as batteries, load controllers and lamps.

Micro and mini hydropower plants

A practitioner's course for participants of Nicaragua and Honduras has been implemented for the installation of pumps used as turbines and motors used as generators for up to 3 kW.

The most important actors of the coffee growing areas in the country have been identified for the pico hydropower scheme and the first sites have been identified. After the installation of the first sites a financing scheme will be designed for the interested families in cooperation with the coffee sector. The first pico axial turbine has been installed in the country and the installation of a second one is under way. The axial turbines have been constructed in one of the hydro courses implemented for technicians of small and medium enterprises of Nicaragua and Honduras. The construction costs for the sites and the wiring for connecting the households have to be covered by the interested families.

Grid extension and densification

The connection works of additional 1,744 households in 30 additional communities in the concession area of the distribution utility DNDS are well under way (10,115 persons) and will be reported until the next reporting period.

Sustainability

PV for households

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 technology and services throughout the country. The exit strategy is based on gradual reduction of the EnDev subsidy according to the market penetration and cost reductions of solar technology.

Micro and mini hydropower plants

Sustainability of the hydropower activities is based on the strong ownership and involvement of MEM with its 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 capacity development for operation and maintenance.

Grid extension and densification

The grid activities are embedded in strong and sustainable national ownership and electricity service structures with a cross subsidized tariff structure favouring rural areas and customers.

Further information

A sustainability study of the improved cookstove activity of EnDev1 has been implemented in order to identify the lessons learnt and gain insight into the specific sustainability factors.

Peru

Promoted technology	Solar / Biogas / Stoves / Hydro / Grid / Other		
Project budget	EUR 6,400,000	**Spent until reporting date**	EUR 3,355,282
Project period	06.2009 – 12.2014	**Reporting period**	06.2012
Lead executing agency	Peruvian Agency of International Cooperation ACPI, The Presidency of the Council of Ministers		
Implementing organisation	GIZ		
Implementing partners	Ministry of Energy and Mines, Ministry of Agriculture, Ministry of Health, Ministry of Development and Social Inclusion, regional governments, governments of provinces, private companies especially mining		
Involved bilateral / multilateral programmes	The National Program for Food Supply at Schools Qali Warma (Ministry of Development and Social Inclusion); Program for the Equipment of Rural Construction (Ministry of Housing and Construction); Fund of Energetic Social Inclusion (Ministry of Energy and Mines); Program for Competitiveness – Agroideas (Ministry of Agriculture); Regional Plan for Rural Grid with Renewable Energy 2010-2014 (regional government of San Martin); Project for the improvement of the rural grid – FONER; Program of Solutions of Renewable Energy by FONDESURCO		

Target (number of beneficiaries)	**Target till project end**	**Achieved till 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in households	175,000	94,935	116,275	people
Cooking energy for households	160,000	496,540	549,400	people
Electricity and / or cooking energy for social infrastructure	4,700	1,567	2,162	institutions
Energy for productive use / income generation	2,500	2,225	2,624	SMEs

Project strategy and key components

EnDev-Peru is running a multiple energy access approach comprising grid densification, pico PV systems clean cookstoves and technologies for productive purposes.

Rural electrification

Grid extension: In the framework of the national rural electrification campaign government, EnDev-Peru has developed the strategy “Safe Rural House” to promote access to safe interior electric connections, and to this effect develop awareness raising campaigns for the rural population, as well as promoting the training of local electricians.

Pico PV / SHS: The Peruvian government also promotes rural electrification with renewable energy through purchasing and giving concessions for solar home systems that will be managed by regional companies of electricity distribution under the fee–for-service concept. EnDev will integrate an information, education and communication strategy that will optimize the adoption process, good usage and maintenance of the technology.

Improved cookstoves

The project line of energy for cooking is implemented in the framework of the “National Campaign of Half a Million Improved Stoves for a Peru without Smoke”. This campaign having been concluded, EnDev focuses on: (1) improving the supply of cookstoves through the

structures created during the campaign and (2) assuring sustainability of the stoves promoted during the campaign, through technical assistance to regional governments.

Productive use

EnDev promotes productive uses through collaboration with microfinance institutions (solar water heaters for hotels, etc.) and supporting a national programme for competitively in the agricultural sector (dryers, etc.). EnDev provides technical assistance mainly directed at networking actors and at capacity development for creation of sound business plans.

Project progress (overall progress towards outcome target EnDev 2)

Rural electrification

Grid extension: Around 60 electricians have been trained for in this period, carrying the total to 500. In the past year, and with the purpose of consolidating sustainability of the strategy, EnDev is insisting that the identified entrepreneurs (local companies, contractors and electricians) strengthen and promote an integral service offer that comprises qualified labour, information on electric safety and sales of quality material.

Pico PV / SHS: A laboratory and field study on pico PV systems has been concluded and subsequently 414 pico PV systems for households were installed (plus four systems for social institutions). 30 SHS for households and one SHS for social institutions were installed. A training course for local technicians on installation and maintenance of SHS was developed.

Improved cookstoves

Strategic alliances were reinforced with public institutions and private companies investing into improved cookstoves as part of their programmes and CSR strategy.

EnDev continued to strengthen the capacities of the stove testing centre in Lima.

Field studies have been carried out on the state, usage and maintenance of the improved cookstoves in La Libertad, Apurimac, Moquegua, Ayacucho and Huancavelica that have permitted to take corrective actions. Further studies supported by EnDev highlight the beneficial impact of ICS on health.

Productive use

To date, EnDev has enabled the installation of 14 solar water heaters, 150 safe interior electric connections, 33 pico PV systems, 119 improved cookstoves, 29 improved ovens and one pilot of biodigestors for SME's. EnDev has also facilitated the installation of solar dryers, electric sieves and descapsuling machines for 2,278 partners of producer associations.

EnDev has organised stakeholder meetings in two regions resulting in many proposals for productive use investments, to be supported by the national programme for competitiveness.

Sustainability

EnDev tries to ensure a sustainable market at two levels, across all lines of work: (a) Community level: It aims at strengthening a rural market through qualified providers, whose services offer a certain level of quality and also provide user information. (b) Institutional level: It aims at involving governments, institutions and companies of the electricity, extraction, production, commercial and financial sectors.

In order to ensure the sustainability of cookstoves installed, EnDev developed a good usage and maintenance strategy. This strategy will count with three components: verification of the ICS state, massive information campaign and integration of the theme into policy advice for local and regional governments.

Rwanda

Promoted technology	Hydro / Biogas		
Project budget	EUR 7,200,000	**Spent until reporting date**	EUR 3,535,440
Project period	10.2009 – 12.2013	**Reporting period**	06.2012
Lead executing agency	Ministry of Infrastructure (MININFRA) / Energy, Water and Sanitation Authority (EWSA)		
Implementing organisation	GIZ		
Implementing partners	MININFRA / EWSA, Private sector (MHP)		
Involved bilateral / multilateral programmes	World Bank, ESME / GVEP, BTC, SNV, KfW		

Target (number of beneficiaries)	**Target till project end**	**Achieved till 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in households	19,700	1,813	6,955	people
Cooking energy for households	20,544	7,257	7,673	people
Electricity and / or cooking energy for social infrastructure	5	0	0	institutions
Energy for productive use / income generation	30	0	0	SMEs

Project strategy and key components

The Private Sector Participation (PSP) Hydro Project aims at developing a private hydropower sector in Rwanda by development of micro-hydropower plants (MHPPs) and by consolidation of the participation of private MHP developers in the energy sector.

The activities to achieve these key interventions include the development of capacity in Rwandan small and medium-sized enterprises through technical and business assistance as well as co-financing of privately owned hydropower plants. Furthermore the project is active to give political support and institutional guidance as well as assistance and tutorage for sector consolidation. The project also cooperates with other donor institutions in aligning the subsector's technical and financial development and in the development of conducive policy and regulatory frameworks.

PSP Hydro currently supports six private utilities / MHPPs. In addition, the project has started to support MININFRA and the Energy Water and Sanitation Authority (EWSA) in the privatisation of publicly funded MHPPs. Negotiations with other donors such as The World Bank have been carried out in order to raise additional funds to scale up the PSP Hydro project.

The 1st phase of the national domestic biogas program (NDBP) was implemented directly by the Ministry of Infrastructure (Energy section) with technical support from EnDev and SNV between 2007 and 2011. Since EnDev involvement in the NDBP ended in December 2011, the NDBP is implemented by EWSA. The NDBP continues to target households in rural areas that own at least two to three cows in a stable near the homestead under zero grazing conditions.

Project progress (overall progress towards outcome target EnDev 2)

The grid connected micro hydropower plant (MHPP) of Mazimeru (500 kW) started operating on in April 2012. This is, after the Murunda MHPP in 2010, the second power plant ever developed and operated by a private company in Rwanda. The development of the first private

plants was started under EnDev 1. However, completion took considerably longer than expected due to absence of a clear regulatory framework, uncoordinated grid extension plans of EWSA, lack of capacities (managerial as well as technical) of local developers and difficulties to obtain bank loans due to regulatory uncertainties. Further details about these factors are described in the previous reports.

Recent development shows further improvements in the sector. A renewable energy feed-in tariff (REFIT) for small and mini-hydropower has been issued in February 2012. The REFIT guarantees access to the grid for renewable energy generators and obliges the national utility EWSA to purchase the renewable energy generated which reduces uncertainties for investors and facilitates access to bank loans. In the case of Mazimeru, a wheeling tariff agreement was concluded which constitutes the first arrangement of this kind in Rwanda and Sub-Saharan Africa. These developments make it likely that in the future private MHPPs can be developed significantly quicker.

The Government of Rwanda continues to embrace the PSP Hydro approach and is developing lease contracts for private operators of publicly funded plants.

Up to June 2012 EnDev-Rwanda has supplied 6,955 people with full access to electricity through the two MHPPs. Due to the EnDev 2 support to the national domestic biogas program 7,673 people gained access to biogas for cooking that are accountable to EnDev 2. The average monthly production rate of digesters is at 65 out of which EnDev reports 20% as a result of the former involvement in NDBP.

Sustainability

The case of the 1st successful MHPP developer (REPRO) shows that the technical support and the grant provided is enough to reach technical and financial feasibility for the project. Therefore, individual projects developed by PSP Hydro are expected to survive even after the termination of the project in Rwanda. This is strengthened by the fact that both developers started to develop additional MHP schemes to extend their MHP business. Also, the regulatory and policy framework has considerably increased during the last years. However, there are currently not enough private companies within the hydropower sub-sector in the country to make it sustainable and self growing sector.

Yet, other donors are increasingly becoming active in the field and are adopting the PSP Hydro approach. Even more importantly, with the government increasingly adopting the privatization approach as its own a positive signal has been sent indicating continued support for private companies in the micro hydropower sector after the exit of the EnDev programme. It is expected that from this continuous support, existing companies will expand and new ones will develop. The planned privatization of all community-managed MHPPs within the country is expected to create a necessary critical mass of private MHP projects that allow a, be it limited, number of companies to subsist or thrive within the sector.

EnDev retreated successively from the national domestic biogas program (NDBP) during the final year of the 1st phase (2008-2011). EnDev handed over responsibility and ownership for the NDBP to the Ministry of Infrastructure and strengthened the technical advisor role of SNV. The Ministry of Infrastructure has demonstrated ownership through clear financial commitments, covering the program cost (no more EnDev financing necessary). The preparation of a proposal for the 2nd phase of NDBP to attract funding from other donors was supported by EnDev / SNV.

Further information

- http://en.igihe.com/science-technology/rwandan-company-wins-accolade-in-vienna.html
- http://www.gtz.de/de/weltweit/afrika/ruanda/17218.html
- http://energypedia.info/index.php/Rwanda_Country_Situation_r.e

Senegal

Promoted technology	Solar / Stoves / Grid		
Project budget	EUR 7,200,000	**Spent until reporting date**	EUR 6,122,233
Project period	04.2009 – 12.2014	**Reporting period**	06.2012
Lead executing agency	Ministère en charge de l'Energie (MICITE)		
Implementing organisation	GIZ		
Implementing partners	Direction des Hydrocarbures et des Combustibles Domestiques (DHCD), Agence Sénégalaise de l'Electrification Rurale (ASER)		
Involved bilateral / multilateral programmes	Promotion of Renewable Energies, Rural Electrification and Sustainable Supply of Household fuels (PERACOD)		

Target (number of beneficiaries)	**Target till project end**	**Achieved till 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in households	59,700	0	6,004	people
Cooking energy for households	400,000	174,819	221,068	people
Electricity and / or cooking energy for social infrastructure	549	0	0	institutions
Energy for productive use / income generation	145	0	0	SMEs

Project strategy and key components

FASEN

Establishment of commercial supply-demand systems for ICS. EnDev 1 started in urban centres. EnDev 2 focuses on fostering achievements in larger cities and on expansion in rural areas and smaller towns. The increase of professionalism of producers of stoves and inserts (use of machines) shall increase both quantity of stoves produced as well as the quality of stoves through standardization. Distribution networks shall be expanded and strengthened.

ERSEN

Electrification of rural villages in concessions given out by ASER, on demand of the village, through either SHS (small villages) or minigrids and grid extension (larger villages). In addition to household electrification some social infrastructure is generally electrified. Systems are operated and maintained on fee for service basis by several private operators. ERSEN 2 is an extension of ERSEN 1, i.e. electrification of villages according to the same strategy.

Project progress (overall progress towards outcome target EnDev 2)

FASEN

Current result is 27% more than last reporting period and 55% of the overall target. Current level of achievement is slightly above the theoretical linear growth pattern. Progress in the first semester 2012 was hampered by some unrest in the context of the presidential election, which particularly impacted on the results in Dakar and Kaolack (sales in May 2012 were only 25% in Dakar and 50% in Kaolack compared to the beginning of the year). However, after the elections, sales picked up strongly again. This effect was not noticed in the rural areas. The cost-efficiency of FASEN is still very good (about EUR 3-4 per person reached).

Studies show that production in Dakar and Kaolack exceeds sales by about 20%, while, on the other hand, stove sales in small towns like Thies and Saint Louis exceed local stove production by 60-90%. This trend, already reported in the last progress report, was analysed in

detail this semester. Traceability of stove sales has improved; though some more work needs to be done (about 800 stoves could not be traced).

The long distance trade of over 3,000 stoves from Dakar to other towns increases the customer price. FASEN invested a lot of work and resources to increase production capacities in rural areas to improve the sustainability of supplies and reduce the customer price. This includes support for mechanised larger scale production facilities (ceramic insert production, machines for metal casing production etc.). But also rural stove producers have been trained to increase outreach into the villages. It is anticipated that these investments will raise the stove sales in the new regions by the end of 2012 considerably. To support this target, the distribution network for the stove has been enlarged and strengthened in these areas.

ERSEN

Under ERSEN 2, 6,000 people were connected during the last semester; this number is lower than anticipated, representing 10% of the projects objective. While the projects' objective of 60,000 beneficiaries is not at risk (over 70,000 are foreseen), again unforeseen delays were faced. Delays faced during the last half year were largely related to administrative issues and required guarantees. While some additional uncertainties still exist, and may cause even more delays, with most of the basic work now performed in the majority of villages, the following prognosis with respect to the development of the number of beneficiaries is maintained: 40,000 beneficiaries by the end of 2012 and 70,000 by mid 2013, after which activities during the remainder will focus on making an keeping the intervention sustainable.

ERSEN 1 operations have improved. The default rate has fallen and the payment rate has increased. ERSEN continues to support the operators. In each of the areas a consultant ensures regular monitoring while supporting and advising operators' technicians. It is believed that complete autonomy in technical and commercial management of equipment will be achieved shortly, which in turn will benefit implementation of ERSEN 2.

Positive results have been obtained in customer management through the use of power-circuit breakers and intelligent energy management devices, cost and performance of which are being discussed with the manufacturer.

Sustainability

FASEN

The improvement of production capacities in Dakar and Kaolack has been completed. FASEN has started to reduce its involvement in these urban centres, focussing mainly on monitoring issues and quality assurance. The supply-demand systems are fairly independent of the program support.

The focus is now on the new (rural) impact areas. A "fair-fair" concept has been developed and applied, using local consultancy firms and NGOs in the implementation of activities. It is planned to mainstream some of the promotional activities into the local authorities and extension services. Partnerships with the leadership of rural communities shall be tried to foster the support for the stove promotion in villages. This work will be intensified in the second semester of 2012.

ERSEN

ERSEN 1 villages in principle are self sustainable; the service fee should enable operators to properly maintain systems and as indicated above operations in these villages are nearing complete autonomy in this respect. Monitoring will go on at least for the duration of the project i.e. till end 2014

Uganda

Promoted technology	Solar, Stoves, Hydro, Grid			
Project budget	EUR 4,000,000	**Spent until reporting date**	EUR 3,959,998	
Project period	04.2009 – 12.2012	**Reporting period**	06.2012	
Lead executing agency	Ministry of Energy & Mineral Development (MEMD)			
Implementing organisation	GIZ			
Implementing partners	Rural Electrification Agency (REA), NGOs, Private Project Developers			
Involved bilateral / multilateral programmes	Promotion of Renewable Energy and Energy Efficiency Programme (PREEEP)			
Target (number of beneficiaries)	**Target till project end**	**Achieved till 12.2011**	**Achieved till reporting date**	
Energy for lighting / electrical appliances in households	29,000	2,287	3,555	people
Cooking energy for households	1,100,000	676,385 (386,075[11])	366,205	people
Electricity and / or cooking energy for social infrastructure	194	34	121	institutions
Energy for productive use / income generation	240	62	98	SMEs

Project strategy and key components

EnDev-Uganda is supporting the dissemination of improved cookstoves through commercial (urban) and semi-commercial (rural) approaches. In urban contexts EnDev focuses on establishment of stove producer associations. Recommendations from the EnDev sustainability study were analysed and an improved approach for rural areas aiming at close cooperation with the local private sector was developed. EnDev also promotes the dissemination of PV systems for households, SMEs and SI by market development and by a direct subsidy for SI. As a third component EnDev supports electrification of trading centres and surrounding villages by micro hydropower (MHP) and grid densification.

Apart from working with beneficiaries, the programme strives to improve its approach in terms of suitability in its context, cost efficiency, sustainability and impact. A key factor for the programme to be considered sustainable is the establishment of a replication mechanism embedded in Ugandan public / private structures thus ensuring future up-scaling.

Acknowledging problems in the past set up of the programme that led to unacceptably high per capita costs for electrification activities and to insufficiently sustainable ICS activities, an assessment of approaches (technical, financial, etc.) was undertaken to improve future activities. Key criteria were cost-benefit ratio, implementation time, up-scaling potential and sustainability. Some adjustments are already implemented; others are pending.

Project progress (overall progress towards outcome target EnDev 2)

ICS dissemination

In the previous report flaws in ICS programme set-up and monitoring were reported as well as staff issues that hindered progress. As a consequence of the flaws all monitoring data came under scrutiny. As the reliability of some of the data could not be proven, previously

[11] After revision of all monitoring data and according to new counting/calculation method

reported figures were corrected and the number of outcome drastically reduced. Parallel a new monitoring system was developed to ensure a higher reliability of data.

The staff problems could meanwhile be solved. The new stove team revised the approach of the component. Focus is on cooperation with the private sector providing support to foster business and marketing skills and quality control. A baseline study in West Nile region should identify new districts for up scaling.

To remedy gaps in monitoring, mobile phone communication is contemplated. This would enable stove producers to report in real time and would also reduce travel time and cost.

PV dissemination

The approach was modified, redesigning business and technical trainings into tailor-made trainings to meet needs of individual dealers while focus shifted to sales training. Social infrastructure with broken-down PV systems will be assessed and solutions and cost implications developed; repaired PV systems will be used for promotion activities.

The lack of access to funds for potential customers is a key obstacle for which cooperation with MFI Tujijenge was established. Solar lanterns were included in monitoring. Cooperation with the Prime Minister's Office on a subsidy scheme for social infrastructure is underway.

Electrification

The Bwindi MHP is operational since April; 61 customers were connected by June including a hospital with 40,000 patients / year. There is constant supervision; no major problems are identified so far. Staff underwent a training programme, the community received training on health and safety issues, manuals were composed and a sensitization workshop on productive use was held. Work at Suam MHP is nearly completed and testing is foreseen for September. A support package similar to Bwindi is foreseen.

Grid densification is nearly completed in Konapak and Ameni, with power lines energized, various customers connected and many more in the pipeline. Implementation followed a community-based approach, in order to deal with some unexpected delays a "follow-up" consultant was hired to eventually ensure maximum numbers of customers.

Sustainability

ICS dissemination

Sustainability is primarily ensured by the private sector approach that EnDev now strives for, creating a commercial market.

PV dissemination

The programme focusses on creating a sustainable PV market through a viable network of rural solar dealers, financial institutions and equipment suppliers from Kampala. Close cooperation with MEMD and REA ensures that governmental institutions can follow up. For sustained monitoring an SMS-based system is piloted and initial results are analysed. Specific support for SI is implemented jointly with MEMD and the office of the prime minister.

Electrification for the MHP projects

A local community-based organisation serves as board, controlling the staff of the company that operates the schemes and having a mandate to step in when required. The tariff structure should suffice to maintain the scheme financially. MEMD, REA and GIZ agreed to hand over the project after commissioning to REA, ensuring REA supervision of the scheme.

For the grid densification projects the handover strategy is coordinated with REA, MEMD and the concessionaires. After construction, the line is inspected and integrated into the national grid. O&M is responsibility of the area distribution grid concessionaire, e.g. UMEME.

F. Up-scaling proposals

Bangladesh

Project phase	old: 10.2010 – 03.2014			new: 10.2010 – 12.2014		
Project budget	old: EUR 7,850,000			new: EUR 8,850,000		
Target groups	Rural population of Bangladesh					
Expected outcome at project end					old target	new target
Number of people	Energy for lighting and electric household appliances				740,000	740,000
	Cooking energy for households				500,000	680,000
Number of institutions or enterprises	Electricity and / or cooking energy for social infrastructure				0	0
	Energy for productive use / income generation				0	0
Promoted technology	[ ] Solar	[ ] Biogas	[×] Stoves	[ ] MHP	[ ] Grid	[ ] Other
Summary of key interventions and outputs	Support the electrification and energy access of approximately 1.6 million people, through introduction and promotion of affordable, energy efficient and renewable energy products. • Improve the framework conditions necessary for the market based dissemination of solar home systems, pico PV systems and improved cookstoves • Organisation and coordination of awareness raising and market development activities • Training of technicians for the production and maintenance of solar home systems and improved cookstoves • Capacity building within stakeholders relevant for management of cookstove projects • Drive and steer stove development and innovation and ensure product quality					
Coordination with other programmes	S / SHS Project: IDCOL donor organisations (IDA, ADB, SIDA, DFID, KfW) ICS Project: Ministry of Environment and Forests (Mission 21)					
Lead political partner	Power Division, Ministry of Power, Energy and Mineral Resources Ministry of Environment and Forests					
Implementing organisation	GIZ					
Implementing partners	SSHS project: IDCOL pico PV project: NGOs and private organisations, IDCOL ICS project: NGOs, private entrepreneurs, local government boards					
Project manager	Name: Erich Otto Gomm Mail: otto.gomm@giz.de					

1 Situation analysis

Bangladesh is one of the world's poorest and most densely populated nations. The last Household Income and Expenditure Survey in 2010 classified 31.5% of the country's population as "poor" (i.e., incomes below the upper national poverty line). In rural areas this rate is even higher: 35% of the rural population qualify as poor. 17.6% of the population is considered "extremely poor" (rural: 21.1%), having incomes below the lower poverty line.[12] Lack of access to modern energy services is one of the reasons for poverty and low economic development. Almost 75% of Bangladesh's 148 million citizens live in rural areas.

A mere 6% of the entire population has access to natural gas, primarily in urban areas. Biomass fuels, such as wood, biomass briquettes, cow dung and agricultural residues are collected mainly from the local environment and have become a traded commodity as cooking fuel as access to local biomass becomes ever more difficult. Inefficient, kerosene based lamps are the most common sources of light.

According to official records of the Forest Department, about 2.53 million ha of total land in Bangladesh is considered to be forest land. Only 10% of this forest land is under tree cover while the rest of the forest land is either encroached or converted to other land uses. The national forest and tree resources assessment 2005-2007 indicated that about 1.442 million ha (representing 9.77% of land) is considered as forest among other land uses of the country. Of this total forest area, 84% is classified as natural forest and 16% is classified as plantation forest. There is no doubt about the fact that forest condition of this natural forest has been over the last 40 years due to over exploitation, illegal logging and encroachment. Per capita forestland in Bangladesh has declined from 0.035 ha in 1969 to 0.020 ha in 1990 due to increasing population in the country.

1.1 Energy situation

About three quarters of the population of Bangladesh live in rural areas. Due to the lack of alternatives the rural population depends mainly on biomass and kerosene as sources of energy for cooking and lighting. Over 70% of the total primary energy supply is biomass, mainly agricultural waste and wood. This represents around 50% of Bangladesh's total energy demand.

Over 90% of all Bangladeshi households use biomass such as wood, cow dung, jute sticks or other agricultural residues for cooking. Inefficient and poorly ventilated clay stoves produce fine particles, polycyclic aromatic hydrocarbons, carbon monoxide, dioxins and other carcinogens. Housewives are exposed to high levels of these toxins between three and seven hours a day. Research revealed that this indoor air pollution occurs not only in the kitchen but only slightly lower in the living area therewith affecting also other family members such as children. The World Health Organisation states that IAP accounts for 4% of all diseases and 46,000 deaths in Bangladesh alone.

The sheer growth of population and dependence on wood and biomass as cooking fuel sends an alarming signal. The estimated rate of deforestation in natural forests during 1981-1985 was 8,000 ha annually, which increased during 1990-1995, to an annual rate of deforestation of 8,800 ha (FAO 1999). At the same time, the population of Bangladesh has increased rapidly. The annual deforestation rate in South Asia is 0.6% whereas in Bangladesh it is estimated to be somewhere between less than 1% and 3.3%.

1.2 Policy framework, laws and regulations

All problems mentioned related to inefficient biomass use and indoor air pollution are addressed in the Bangladesh Poverty Reduction Strategy Paper (PRSP), chapters 5.H.1 'Conservation of Nature' and 5.H.2 'Combating Pollution':

[12] The 16 national poverty lines are defined regionally according to the local purchase power. According to the latest World Bank figures 43% of the population are very poor (less than 1.25 USD per person and day) and 76% are poor (less than 2 USD per person and day).

- "The relationship between the amount of the firewood use and level of income is clearly positive and monotonic. This means that the poor has much less access to quality fuel for cooking. Income poverty thus translates into energy poverty." (p. 164)
- "Population pressure on land has been leading to conversion of forest land and land under tree cover into other uses. This at the same time further lowers the supply of biomass and fuelwood for cooking raising their market value including further deforestation and cutting down of trees. Smoke due to fuelwood burning also is a major cause of a significant rise in the level of indoor air pollution affecting adversely the health of women and children." (p.164)
- "Air pollution needs to address both the outdoor and indoor sources of pollution. […] Indoor air pollution is mainly caused by cooking fuels such as firewood and dried cow dung. Most of the poor families use these as fuel and women and children are the main victims of indoor air pollution. Due to air pollution the number of people suffering from respiratory diseases is on the rise." (p. 167)

The PRSP derives the following national strategies to address the mentioned problems:

"For controlling indoor air pollution use of natural gas, biogas and LPG may be encouraged through various means including policy supports for their lower relative prices as well as more efficient and cost- effective cookstoves." (p. 167)

The introduction of energy efficient cookstoves was made one of the key targets to control air pollution in rural settings:

"Building coalitions with NGOs for wider dissemination of fuel-efficient cooking stoves" and "Promote R&D to change building and construction standards and designs for pollution-free kitchens" were the respective planned actions on the policy agenda for the fiscal year 2005 / 06 (p. 301).

The Ministry of Environment and Forests has announced the ambitious plan to cover 100% of all households in BGD with improved cookstoves. This would require the dissemination of roughly 30 million stoves over the next 10 years.

EnDev activities are consistent with the national policies and plans mentioned since they will contribute to (1) a reduction of forest degradation, (2) an improvement of rural livelihoods and (3) a better health situation in rural homes.

1.3 Institutional set-up in the ICS sector

1.1.1. Governmental sector

Governmental organisations are not very active in the field of ICS. The Bangladesh Council for Scientific Industrial Research (BCSIR) came up with the original design of the concrete stove 10 years ago but currently plays only a minor role in the stove sector. The Ministry of Energy is considering to sponsor stoves but has no practical experiences with stove dissemination.

1.1.2. Private sector (enterprises, NGOs)

Grameen Shakti (GS) is the biggest NGO involved in the dissemination of renewable energy technologies in Bangladesh. GS has installed around 550,000 ICS and 930,000 SHS so far and is one of the two project participants under JP Morgan's CDM program for ICS dissemination.

SZ Consultancy Services Ltd. (SZ) is a private consultancy and participant of the ICS CDM project under JP Morgan. SZ monitors the distribution of stoves, assists in capacity building and bundles the distribution of many small enterprises to provide them with access to CER revenues.

Rural Services Foundation (RSF) is engaged in the dissemination of renewable energy technologies.

Palli Karma Sahayak Foundation (PKSF) has been created by the Government of Bangladesh as a not-for-profit organisation and is undertaking nationwide programs for poverty alleviation through employment generation.

Since June 2008 the Village Education Resource Center (VERC) is implementing a project entitled “Development of an Improved Cookstoves Project to Secure carbon Finance for its long term Sustainability”. The project is covering five sub-districts in Rajshahi division, three sub-districts in Ranjpur division and one sub-district under Dhaka division of Bangladesh.

1.4 Major donor activities

SNV is active in the field of biogas technology dissemination and is showing interest in improved cookstoves.

The Urban Partnership for Poverty Reduction (UPPR) (initiated by UNDP) is collaborating with EnDev in the cookstove sector and is also open for cooperation in biogas plants in urban settings.

The U.S. Agency for International Development (USAID) has been supporting rural electrification programs in Bangladesh for the last 35 years. Currently, USAID supports the implementation of the project “Integrated Protected Area Comanagement” (IPAC). This project and EnDev are collaborating in the promotion of improved cookstoves.

Practical Action (PA) is mostly active in infrastructure and livelihood improvement in poor urban areas. As part of their efforts to provide energy access to the poor, they are interested to cooperate with EnDev in the promotion of improved cookstove as well as related monitoring and evaluation activities.

Swedish International Development Agency (SIDA) is planning to start improved cookstove activities in Bangladesh. It is not yet decided whether this will happen in cooperation with EnDev.

UK Department for International Development (DFID) has made tremendous funds available for electrification projects. They have indicated strong interest in SHS / SSHS, pico PV as well as improved cookstove activities. Also they will be active in the field of political advisory, e.g. they are working on the topic of reallocation of subsidies for energy services and fuels.

The Climate and Clean Air Coalition (CCAC) is a new partnership between USA, Canada, Sweden, Mexico, Ghana and Bangladesh. This group is focussing on the reduction of short-lived pollutants such as black carbon and methane by promoting new environmentally friendly technologies and processes like improved cookstoves, brick kilns and rice parboiling systems. Detailed discussions for cooperation have taken place in Toronto and Paris recently and Bangladesh has - supported by EnDev - taken up the lead position for improved cookstove interventions.

The Global Alliance for Clean Cookstoves (GACC) is a worldwide partnership for ICS-related research and awareness activities with the target to create a thriving global market for clean cookstoves. In collaboration with Accenture Development Partnerships and USAID, GACC has recently conducted a larger ICS market sector study together with USAID and Accenture Development Service and wants to get involved in future activities in the country. EnDev has applied for assistance for an ICS testing facility in Bangladesh.

2 Planned Outcome

Energy service segment	Old target		New target	
Energy for lighting and electric household appliances	740,000	people	740,000	people
Cooking energy for households	500,000	people	680,000	people
Electricity and / or cooking energy for social infrastructure	0	institutions	0	institutions
Energy for productive use / income generation	0	enterprises	0	enterprises

3 Project approach

Through its program Sustainable Energy for Development (SED), GIZ is in a driving position in the renewable (and also, to some extent, in the conventional) energy sector of Bangladesh, in particular in the area of energy efficiency. It closely coordinates activities with the Government of Bangladesh and other donor agencies.

GIZ started promotion of improved cookstoves in December 2005, using a clay stove. The major focus of the GIZ intervention was on establishment of a self-sustaining supply chain for stoves; this included massive training of stove builders (more than 10,000 persons were trained). Dissemination of the improved cookstove was quite rapid but monitoring showed that the quality of the stoves built was not always according to design standards – as each clay stove was built in situ the margin for error was quite high. To overcome the quality problem SED introduced concrete as the material of choice for manufacturing improved cookstoves in 2010. This allowed mass production and significantly better adherence to quality standards. Since 2010 all stoves supported by EnDev and its partners are pre fabricated stoves and currently built from concrete. As in many technologies, there is a strong push for innovation in this field. In the future the Project wants to encourage stove innovation and improvements and allow for a wider variety of stove types and materials to be developed and tested locally.

Direct financial support for stove installations from EnDev side has been phased out and the project will now increase the focus on capacity building, marketing and awareness activities and incentives for stove innovation. The goal is to spread and foster knowledge on improved cookstoves, their benefits and stove developments among the people of Bangladesh and to encourage and enable entrepreneurs to take up the development, production and sales of fuel saving stoves. In cases where new stoves can be registered under CDM, the revenues will be used to ensure monitoring and quality of the stoves and after sales service on the long run, as the motivation to keep a stove running is higher if there is an annual CO_2 "harvest". This cannot be ensured in all cases, though. GIZ will assist the entrepreneurs to initially set up their stove business and can help to establish contact to CDM authorities, but will not engage actively in the registration process itself.

Direct funding might still be an option for other donors, though, and can help to spread a stove faster. However, excessive subsidies can be counterproductive and harmful for a market. Therefore it is a target of EnDev to form an umbrella or institutional framework in cooperation with the government. This is to ensure and foster better harmonization and knowledge exchange between the agents and to give incoming donors direction with an eye on reasonable and meaningful use of CER revenues and other streams of funding. For this purpose a Project Management Unit will be formed together with the Ministry of Environment and Forests. Once the relevant guidelines are established, GIZ might again consider subsidies for a limited numbers of new high quality ICS models that are not registered under CDM.

The successes in the ICS sector have led to increased interest on the governmental side and other donors. Besides the government, CCAC has also indicated interest to cooperate with EnDev on upscaling the improved cookstove and other initiatives with a focus on short lived climate pollutants like black carbon.

The next steps toward a sustainable open market for improved cookstoves involve the establishment of an institutional and regulatory framework and drivers for product innovation and quality control to allow new stove models to be developed, tested and certified for the local (or even international) market. Besides these new efforts regarding product development SED will continue the ongoing activities of stove promotion and marketing.

Thus the project will build on past successes and experiences and open the approach to new models and materials to add diversity, quality and sustainability to the ICS market in Bangladesh through a wider range of products and providers.

3.1 Energy technologies and services promoted by the EnDev project

EnDev-Bangladesh currently improves access to energy of poor households through its activities to promote energy efficient technologies and solar energy systems as well as through its efforts to make beneficial technologies available and affordable in the local markets. The present up-scaling proposal is only dealing with the stove component.

3.2 Approach to provide electricity to households

The project will focus on the support of awareness, marketing and monitoring activities, as well as capacity development activities in the stove sector, which are seen as the most critical last steps towards a sustainable market for improved cooking appliances. An institutional framework will be created over the long run to harmonize current and future ICS activities in this otherwise unregulated market. Through the closer cooperation with the government and establishment of a combined Project Management Unit as well as testing facilities and stove test- and design trainings the project will provide a lever for innovators and new product developers to enter the stove market in Bangladesh, while at the same time providing customers additional security through a regulatory framework regarding stove quality and performance parameters. This integrated approach will increase the sector capacities to adjust quickly to local needs and changes in the environment as well as the capabilities of entrepreneurs and users to make informed decisions regarding the selection of energy efficient and clean burning stoves.

Since 2010 the project focuses mainly on the promotion of a concrete stove model. While concrete results in higher material cost in the production compared to mudstoves, these costs could be offset through the reduction of time required for the installation of the stove in the household. Mudstoves took a week to be installed in the household and to dry properly. The concrete stoves can be installed within a day. Concrete stoves can thus be sold for about the same price as the mudstoves and are more convenient for the customers, who can now use the new cooking device one day after installation. A further benefit of prefabricated stoves is easier quality control in the production, as the relevant measurements of the stoves are less dependent on individual skills, also due to the introduction of forms used in the production in the case of concrete stoves. As a result of this learning process the project will only support pre-fabricated stoves where quality checks can be made on site of the production besides physical verification in the field. There is no specific material of choice most importantly it must be durable and maintenance works should not easily result in changes of stove dimensions. Everything from concrete, burnt clay, metal or new composite materials can be supported as long as a performance test in an independent organisation approves and certifies quality and performance parameters. Stoves can either be locally produced or imported. Population density in Bangladesh allows for a focus on more centralized partners for the production as ways of delivery are usually not very far, if supply chains and local production centres can successfully be established.

In Bangladeshi households a variety of cooking facilities are being used, therefore the project intends to contribute to more variety of products, so that a fitting stove can be found for different purposes. Rocket stove designs with even higher fuel efficiency or other forms of mobile stoves as well as stoves for variable pot sizes and stoves optimized for different fuel types can be thought of and are still lacking on the market. Spreading new designs will be envisaged in cooperation with other donors and partner organisations active in this field. As further stove tests are planned, stove design workshops will be held on a more regular basis as well.

Good experiences have been made in stove design workshops held in December 2011 and July 2012 in cooperation with the Aprovecho Research Center. This is another viable option for EnDev to build capacities in the sector for quality management as well design of improved cookstoves in Bangladesh. The workshops received very positive feedback from participating stove builders and especially leading personnel of partner organisations. The July workshop aimed mostly at test training and actual testing of the "Bhondu Chula" stoves as well as generating Ideas for stove Improvements. The results showed 40% savings of fuel compared to the traditional stove but also indicated further improvement potentials. Further tests and cooperation with Aprovecho is envisaged and possible either for emission and performance testing in conjunction with training for these tasks, as well as in the establishment of testing facilities in the country.

Further objectives on the marketing side include the increase of EnDev's market intelligence efforts, as well as awareness raising and training on the user side. Lower levels of local governments will be involved more in promotion and support of stove activities in the villages.

The increased participation of the private sector and local government levels is a priority target to speed up the distribution. While in the past cooperation was mostly envisaged with NGOs in the field the project now aims at involvement from private businesses from the relevant sectors. As in the case of sanitary shops for concrete stoves, these businesses are already familiar with the specific materials, manufacturing processes and tools and the products and their handling. As well established trading agents for household appliances, these businesses will be preferable distributors for improved cookstoves as well. Similar to this experience SMEs and partners from relevant sectors will be involved in the production of other stove types built from metal or burnt clay. Working directly with relevant business sectors for specific materials, is on the one hand expected to accelerate the dissemination of concrete stoves. On the other hand these businesses are already familiar with working with the specific materials, which in turn helps to ensure the quality of the product and ensures sustainable supply of stoves, as this is rather a side business for these shops and their income is not only depending only on these products.

There is already at least one partner for the distribution in every subdistrict who has been or is going to be trained manufacturing / selling concrete ICS. Another 2,500 partners are planned to be involved into the project within a year.

Although ICS are simple technical devices, the users still need training on proper use and maintenance. During the project period, EnDev will encourage and support entrepreneurs to conduct users' training and maintenance services. A user manual will also be provided to every ICS household. This training will ensure the proper functioning of ICS. At the project end, the entrepreneurs will be skilled enough to conduct the users' training on their own.

Following training contents will be provided:

- training of trainers
    - training of trainers on ICS & chimney production and installation
    - training of trainers on marketing / promotional activities
    - training on stove design principles and stove testing
- training of entrepreneurs
    - production of ICS
    - installation of ICS

- how to conduct users' training
- training of entrepreneurs on business (bookkeeping, procurement, etc.)
- marketing / promotional activities
- monitoring of ICS dissemination

This way the capacity of the entrepreneurs will be created / enhanced so that they can run ICS business in a professional and financially viable manner. As such the training will incorporate both development of business skills and technical know-how on ICS production, installation, maintenance, monitoring, etc. The ICS entrepreneurs have to provide necessary after sales services; it is part of their business. To ensure after sales services, a service card indicating service warrantee will be prepared. Furthermore, a system of communication between entrepreneur and customer will be developed. Another aspect of training is to provide the users with know-how on ICS use and maintenance, so that minor defects can be repaired by the users themselves.

About 350 dedicated stove promoters ("Champions") are constantly active in assigned regions to seek local government cooperation and support as well as to conduct user trainings and awareness activities and to find new partner businesses. User trainings will be a priority for these stove promoters in the future. Experience has shown that the involvement of women can have positive effects on the results of awareness, monitoring and marketing activities. Eleven women have recently been employed as champions in nine subdistricts. A more gender sensitive approach in this regard can have benefits and risks in Bangladesh. As the situation of women in Bangladesh does not allow for far travels or work after dawn, the project will gradually increase the quota of female agents in the management, steering and implementation of ICS activities and carefully scope options to involve women more in different stages and levels of the project and promote gender equality.

For successful implementation of any project, the participation of the local governments is of utmost importance. The project will be implemented in close cooperation with local governments. However, the local governments are still mostly unaware about ICS and the advantages of their usage. To sensitize the local government members and to seek their support the Champions will organize two coordination meetings (one at the beginning and one at the end of the project) with each subdistrict council and each union council. In order to motivate the people to become ICS entrepreneurs, information sessions and awareness building campaigns will be conducted among potential professional groups e.g. associations of masons, associations of sanitary shops.

There will be multiple dimensions of monitoring. Not all of these activities are current practice in the project implementation as technical know-how for the tasks was not available in Bangladesh. Some trainings focusing on these topics have been conducted by know so the following activities will be an integral part during and beyond the project duration: (1) monitoring of ICS quality at the factory level (2) monitoring of ICS installation in the kitchens, (3) monitoring of ICS use, (4) monitoring of ICS sale, (4) monitoring ICS performance, (5) monitoring of customers' satisfaction, (6) monitoring of ICS business and sector development, and finally (7) evaluation of activities described above.

3.3 Approach to provide clean cooking technologies to households

Not relevant for this proposal

3.4 Approach to provide access to modern energy services for social institutions

Not relevant for this proposal

3.5 Approach to provide access to modern energy services to SME's

Not relevant for this proposal

4 Expected impacts of the project intervention

Impact	Possible indicators
Environment	less wood burned in households and reduced deforestation; reduced CO_2 and black carbon emissions
Health	reduced indoor air pollution
Poverty / livelihood	better living and working conditions in the household; monetary or time savings due to less fuel consumption
Education	The people in the project area will become aware about the ICS and their benefits / the negative aspects of indoor air pollution and traditional stoves.
Governance	An institutional arrangement is in place that allows better harmonization of ICS interventions and steering of the sector.

5 Budget

	EUR
1 Human resources and travelling	500,000
2 Equipment and supplies	50,000
3 Funding financing agreements/local subsidies	200,000
4 Other direct costs	113,695
5 Total direct costs	863,695
6 Mark up costs / administrative overheads / imputed profit	136,305
7 Cost price	1,000,000

Benin stoves

Project phase	old: 10.2009 – 12.2013			new: 10.2009 – 12.2014		
Project budget	old: EUR 2,000,000			new: EUR 4,000,000		
Target groups	Rural, peri-urban and urban households					
Expected outcome at project end					old target	new target
Number of people	Energy for lighting and electric household appliances				0	0
	Cooking energy for households				400,000	800,000
Number of institutions or enterprises	Electricity and / or cooking energy for social infrastructure				0	0
	Energy for productive use / income generation				0	0
Promoted technology	[ ] Solar	[ ] Biogas	[×] Stoves	[ ] MHP	[ ] Grid	[ ] Other
Summary of key interventions and outputs	Key intervention 1: Massive scaling-up of promotional activities for ICS in the new intervention zones of EnDev 2. Key intervention 2: Consolidation and targeted extension of production capacities in the new intervention zones of EnDev 2. Key intervention 3: Progressing in the phasing-out of the EnDev 1 intervention zone					
Coordination with other programmes	Promotion of Agriculture (ProAGRI / GIZ)					
Lead political partner	Ministry of Agriculture, Breeding and Fishery					
Implementing organisation	GIZ					
Implementing partners	Ministry of Agriculture, Breeding and Fishery; Ministry of Energy, Petroleum and Mine Research, Water and Renewable Energy Development					
Project manager	Name: Dorith von Behaim			Mail: dorith.von-behaim@giz.de		

2. Situation analysis

2.1. Energy situation

Benin is a least developed country in West Africa with a small southern coastline on the Bight of Benin where a majority of the population lives. Benin covers an area of approximately 110,000 km², with a population of approximately 8.8 million (World Bank, 2010). Classified as a low-income country, Benin is ranked 134th out of 169 on the 2010 UNDP Human Development Index. About 75% of the population live on less than 2 USD a day (World Bank, 2006). In 2010, 41% of Benin's population was living in urban areas, and the projections of the National Institute of Statistics and Economic Analysis predicted that by 2025 approximately 60% of the population will live in cities, mainly located in the coastal areas.

Benin's total energy consumption in 2009 was 3,475 ktoe (World Bank, 2009). The per capita energy consumption in the same year was 0.404 toe. This is about half of the average per capita energy consumption for Sub-Sahara African countries, and less than a quarter of the world average (World Bank, 2009).

As in most countries in Sub-Saharan Africa, Benin's energy sector is largely dominated by the use of biomass-based energy sources (59.4%) (Tableau de Bord de l'Energie au Bénin, 2005), followed by petroleum products (38.4%) and, to a lesser degree, electricity (2.2%). Main biomass-based energy sources available are the forest located in the central and northern regions of the country. Wood products, particularly charcoal, are transported to the large urban centres in the South, where population growth is relatively high (average of 4.6% per year). Sawdust and agro-waste are other biomass energy sources of minor importance.

In 2005, the largest final energy consumer in Benin was the household sector (64%), followed by transport (23%), services (11%) and industry (2%). While in urban areas, charcoal is the main fuel, the rural households predominately use fuelwood. Wood is also used in the cottage industry (e.g. small scale fish smoking, bread baking and restaurants).

Biomass as fuel is still available in all parts of the country. However, in urban settings, particularly in the South, it has become an expensive commodity. The forest resources are unsustainably used by a variety of actors and for different needs (cooking energy, construction, increase of arable land etc.). The use of biomass energy is not the exclusive driver of deforestation, but it is a contributing factor.

There is an overall shortfall in the supply of fuelwood energy at the national level since 2004, with wide variation at the regional level. Projections show that the production will satisfy only 56% of the demand of primary fuelwood energy by 2015 (TBE, 2005). The forest area in Benin decreased by about 22.8% (i.e. 1.2 million hectares) from 1990 to 2010 (FAO).

On the demand side, more than 77% of the household energy consumption depends on traditional biomass-based products, particularly fuelwood and charcoal. Despite efforts aimed at substitution and electrification, the consumption of biomass fuels is still increasing. It is reported that until 2015, the annual increase in demand for wood fuel and charcoal will be respectively 2.75% and 3.55%. The reason is that biomass fuels are more affordable than alternative fuels and are more accessible. Users don't depend on utilities or imports like fossil fuels. Biomass fuels will remain the most important source of energy for the next decades. Currently, the majority of households are using open fires or traditional stoves with energy efficiencies between 10 and 13% for wood stoves and 15 to 25% for charcoal stoves. The best way to reduce the demand is to further increase the use of more efficient biomass cookstoves. The government is planning projects on alternative energies to biomass-energy but no concrete actions have been undertaken today.

2.2. Policy framework, laws and regulations

The overall objective of the energy policy is to ensure the secure supply of the country so that energy is available to the households and economic sectors in quality, in sufficient quantity, and at low cost while taking into account environmental aspects.

The development strategy of the energy sector in order to achieve the Government's objectives has been elaborated by sub-sector. The sub-sectors include (i) electricity, (ii) hydrocarbons and other fossil fuels, (iii) biomass energy and (iv) renewable energy.

To achieve the objectives of the energy policy in the Biomass Energy's sub-sector, the planned actions aim at:

- strengthening national capacities for planning and management of the sub-sector of domestic fuels, and for the control of biomass energy;
- streamlining and diversifying the production of biomass energy through support to community management of natural resources on national territory;
- contributing to the reduction of human pressure on the vegetation cover for sustainable management of forest resources through the promotion of rational use of wood energy, the promotion of improved cookstoves and promotion of modern domestic energies which substitute the wood energy;
- promoting local development of modern biofuel supply chains (specifically bioethanol and biodiesel) from various agricultural raw products (cashew nuts, cane sugar, Jatropha, castor oil, etc.) locally available in order to reduce the dependence of the national economy towards the imports of petroleum products and promote rural development and the development of local agro-industries.

In 2010 The Ministry of Energy, Petroleum and Mine Research, Water and Renewable Energy Development released the Energy Information System report which presents the energy situation of Benin and its evolution, based on energy balances developed for the years from 1996 to 2010. The report provides (i) recommendations for improving the energy sector's development strategy, (ii) a planning of services to develop in order to achieve the Millennium Development Goals and (iii) information on the current policy and strategy development in the Energy sector.

A recommendation of the report for the achievement of the Energy Goals in Benin is to allow the adoption of modern fuels by at least 50% of households that currently use traditional biomass for cooking. Furthermore, it recommends supporting (i) efforts to develop and adopt the use of improved cookstoves, (ii) measures to reduce adverse health impacts of cooking with biomass, and (iii) measures to increase sustainable biomass production.

The report points out in particular that Benin needs to increase the access rate to improved cookstoves from 3% in 2010 to 60% in 2015 to achieve its MDGs.

The promotion of improved cookstoves through EnDev is therefore fully in line with the energy policy targets and strategy of the Ministry of Energy, Petroleum and Mine Research, Water and Renewable Energy Development.

2.3. Institutional set-up in the energy sector

The Ministry of Energy, Petroleum and Mine Research, Water and Renewable Energy Development is responsible for managing the energy sector. Under its authority, the General Department of Energy is the State’s technical service for energy matters. Its mission is to formulate government policies in the energy sector and to oversee their implementation in conjunction with competent national structures. Additionally, it covers activities such as planning the development of the energy sector, proposing regulations applicable to the sector activities, monitoring of law enforcement, and ensuring that projects / programs within the sector are in line with planned targets. Another institution under the Ministry is the Petroleum

Operations Bureau, which implements the state oil policy and preserves the rights of the state in oil and gas operations.

The Ministry of Industry and Trade intervenes in the management of the hydrocarbons sub-sector, where it supervises the marketing of oil companies. Two departments under the Ministry have missions related to the management of this sub-sector.

The Department of Competition and Domestic Trade is mandated to implement the national policy on competition, prices and internal trade. The Department of Meteorology, Standards and Quality shall ensure a good quality of measuring devices.

The Ministry of Environment and Nature Protection intervenes in the sub-sector of biomass energy through the Department of Forest and Natural Resources, whose mission is the efficient exploitation of natural resources (soil, water, flora and fauna). Its activities include e.g. controlling the forest industry, planning the development of forests for a monitored exploitation of the resources, growing fuelwood plantations to supplement the supply of natural forest timber and reduce the pressure on them, and restoring the areas covered with highly degraded vegetation, etc.

The Ministry of Agriculture, Livestock and Fisheries is responsible for assisting the Ministry of Energy, Petroleum and Mine Research, Water and Renewable Energy Development in promoting the sustainable use of biomass resources available to the public.

EnDev is supporting some of these institutions partially through their integration into activities of the program in the Biomass Energy sub-sector:

- involvement of the General Department of Energy in the execution of all studies;
- involvement of the General Department of Energy staff in the implementation of training activities;
- support the General Department of Energy staff participation in selected international conferences related to Biomass Energy issues;
- joint planning of the EnDev program activities in Benin.

2.4. Major donor activities

A number of donors are providing financial and technical support to the Government of Benin through her implementing agencies. A list of the active donors in the biomass energy sub-sector is provided in the table below.

N°	Description
1	Project title: PFSE (Projet de Fourniture des Services Energétiques) Partner: General Department of Energy, Ministry of Energy, Petroleum and Mine Research, Water and Renewable Energy Development Donor: World Bank Project Area: Cotonou, Abomey-Calavi, Porto-Novo, Parakou Project status and duration: Ongoing, 2009-2014 Objective: 20,000 poor households are pre-identified equipped with ICS (7,000 ICS in Cotonou, 4,000 ICS in Porto-Novo, 6,000 in Abomey-Calavi and 3000 ICS in Parakou). There is a subsidy of 30% to households that purchased the ICS. Technology promoted: charcoal Jambar stove Form of donor coordination in the sector: Information exchange (formal meeting, study results of PFSE about the promotion of the dissemination of improved cookstoves and wood fuel cooking equipment using alternative energy) Is EnDev-Benin part of this coordination / cooperation: Yes
2	Project title: Cooking energy for productive use (roasting of peanuts and dehydratation of palm oil) Partner: NGO GERES Donor: Currently looking for donors Project Area: Department of Zou

	Project status and duration: Not started yet Objective: Improve the energy efficiency of traditional stoves currently used for operations of roasting peanuts and dehydration of palm oil. Technology promoted: Improved 3 stones Form of donor coordination in the sector: Information exchange (meeting) Is EnDev-Benin part of this coordination / cooperation: Yes
3	Project title: Improve the control capacity of domestic energy for the mitigation of GHG emissions and for a better adaptation to the impacts of climate change in communes of the Zou's Department Partner: ONG OFEDI (Organisation des Femmes pour la gestion de l'Energie, de l'Environnement et la promotion du Développement Intégré) Donor: Agence Walonne de l'Air et du Climat (fast start finance) Project Area: Djidja, Zakpota and Zagnanado Project status and duration: Ongoing, Mid 2011 to Mid-2012 Objective: (i) 90 tinsmiths are trained for the production of the metal ICS (double wall),(ii) 30 potters are trained for the production of the clay ICS (improved 3 stones stove), and (iii) 9,000 women are equipped with improved 3 stones stoves Form of donor coordination in the sector: Exchange of information Is EnDev-Benin part of this coordination / cooperation: Yes
4	Project title: Financing the enterprise MTI Partner: Enterprise MTI (Micro-Techno- Céramique) Donor: French NGO Tech-Dev through the Fonds Afrique (Solidarity venture capital for small businesses in Africa) Project Area: Porto Novo Project status and duration: On-going, 12.2011 to End 2012 Objective: Improved the capacity production of ceramic liners for the production of Nansu metal charcoal stoves Form of donor coordination in the sector: Information exchange (meeting) Is EnDev-Benin part of this coordination / cooperation: Yes
5	Project title: Capacity building of community capacity through activities such as training of local trainers on the construction of ICS and their importance, awareness raising on the importance of educating children especially girls and on the management of school canteens Partner: Local NGOs (NGO Ami Christ and NGO Groupe d'Eveil sur le Développement Durable) Donor: World Food Program Project Area: - Southern Benin (Sô-Ava, Zê, Toffo, Bopa, Grand-Popo, Toviklin, Lalo, Aplahoué, Adjohoun, Adja-Ouéré, Pobe, Sakete, Ifangni et Ketou) and - Central and Northern Benin (Agbangnizoun, Djidja, Zakpota, Savalou, Bembèrèkè, Nikki, Banikoara, Natitingou, Kouandé, Pehunco, Tanguiéta, Toucountouna, Copargo et Djougou) Project status and duration: Ongoing, January 2012 - 2nd Semester 2012 Objective: Phase 1: Fixed Rocket mud stoves for institutional use are built in 300 school canteens, Phase 2: 13,500 mothers of students are trained for the production of fixed rocked mud stoves for household use Form of donor coordination in the sector: Information exchange (meeting) Is EnDev-Benin part of this coordination / cooperation: Yes
6	Project title: Programme d'actions nationales d'adaptation aux changements climatiques du Bénin (PANA) Partner: Ministry of Environment and Natural Resources Donor: UNDP Project Area: Northern and Central Benin (Djakotomey, Kpomassè, Toucountouna, Banikoara, Savalou, Zogbodomey, Aplahoué, Sakété, Karimama, Malanville, Matéri, Tanguiéta, Djidja, Kétou,, Dogbo, Kalalé, Bassila, Zogbodomey, Athiémé, Aguégués, Adjohoun, Ouaké, Ouinhi, So ava), and Abomey, Lokossa, Porto Novo. Project status and duration: Not started, 3 years Objective: Reduce the vulnerability of households and small businesses to the effect of climate change through improved access to renewable energy sources and improved cookstoves in areas where lands are severely degraded Form of donor coordination in the sector: NA Is EnDev-Benin part of this coordination / cooperation: NA

The Benin-German development cooperation is focussing on three focal areas:

- decentralization and municipal development (PDDC) including an EnDev component for rural electrification;
- water
- agriculture (ProAGRI) which is hosting the EnDev component on improved cookstoves

The BMZ also finances a Macroeconomic Adviser on poverty issues.

The Netherland's development cooperation in Benin focuses on the following topics: (i) water and sanitation, (ii) education, (iii) Governance, and (iv) private sector development.

3. Planned outcome

Energy service segment	Old targets		New targets	
Energy for lighting and electric household appliances	0	people	0	people
Cooking energy for households	400,000	people	800,000	people
Electricity and / or cooking energy for social infrastructure	0	institutions	0	institutions
Energy for productive use / income generation	0	enterprises	0	enterprises

4. Project approach

4.1. Energy technologies and services promoted by the EnDev project

Since 2006, EnDev-Benin has been promoting energy-efficient and clean cookstoves in rural and urban areas of Benin. In the first phase until December2009, EnDev-Benin reached almost 100,000 people in households with sustainable access to improved cookstoves in the North-West of the country. Starting from January 2010, the project was then scaled-up and its second phase, which aims to provide an additional 400,000 people by the end of 2013. The geographical outreach has been extended to the South and the North-East.

The table below presents a brief description of the improved cookstoves which are currently promoted, their prices and repayment rate if firewood or coal is purchased by the household.

Stove picture	*Description*	*Stove picture*	*Description*
	**Name:** Nansu **Fuel:** charcoal **Material used:** metal with ceramic liner **Price (2012):** 7.0 EUR **Repayment rate:** 2 months		**Name:** Tulipe **Fuel:** charcoal **Material used:** clay **Price (2012):** 1.5 EUR **Repayment rate:** 2 weeks
	**Name:** Nansu **Fuel:** charcoal **Material used:** fired clay **Price (2012):** 2.0 EUR **Repayment rate:** 2.5 weeks		**Name:** Tulipe **Fuel:** fuelwood **Material used:** clay **Price (2012):** 1.5 EUR **Repayment rate:** 2 weeks
	**Name:** Nansu **Fuel:** charcoal **Material used:** unfired clay **Price (2012):** 2.0 EUR **Repayment rate:** 2.5 weeks		**Name:** Vita stove **Fuel:** fuelwood **Material used:** metal **Price (2012):** 6.0 EUR **Repayment rate:** 1 month
	**Name:** Eclair **Fuel:** charcoal **Material used:** metal **Price (2012):** 7 EUR **Repayment rate:** 2 months		**Name:** Fixed rocket mud stove **Fuel:** fuelwood **Material used:** mud **Price (2012):** 3.0 EUR **Repayment rate:** 2 weeks

In EnDev 1, large-scale cookstoves for social institutions and small productive uses were also promoted. At the end of the first phase, 51 social institutions and 523 small enterprises were using these technologies. However, the promotion of the large stoves was discontinued in the current phase of EnDev to give full focus on the ambitious target on household stoves. Still, the monitoring of the production and sales of large scale stoves continued and has shown that within the first two years of EnDev 2, these large scale stoves have been sold to schools and small businesses in a similar quantity as in the final two years of EnDev 1.

4.2. Approach to provide electricity to households

EnDev-Benin follows a market-based approach to achieve long-lasting results. Its interventions are aimed at establishing a sustainable market for improved cookstoves which are affordable, modern, easy to use, safe, and adapted to the needs and purchase power of the target population. In order to achieve this, the program has analysed the operators and their services along the value chain of ICS from access to inputs to the usage of stoves in the households. Interventions to support the long term sustainability of the supply-demand systems have been identified and implemented accordingly.

The core tasks undertaken by EnDev-Benin are similar to most other ICS programs: (i) awareness raising, (ii) technical and business training of producers, distributors and retailers, (iii) quality testing, (iv) facilitating business to business contacts, (v) market studies and surveys, and (vi) capacity building of governmental and non-governmental organisation.

The type of interventions required for these core tasks are changing in the course of implementation. The sets of activities are different in the start-up phase as compared to a scaling-up or a phasing out situation. The activities for the proposed up-scaling of EnDev ICS work in Benin is therefore structured in key interventions reflecting the different stages of maturity in the intervention zones in Benin.

Key intervention 1: Massive scaling-up of promotional activities for ICS in the new intervention zones of EnDev 2

With the beginning of EnDev 2, the program entered the rural areas of the North-East and the peri-urban areas in the South of Benin. It took some time to identify the right target groups and potential markets. These preparatory works in 2010 and early 2011 resulted in a slow start of stove sales. However, now production capacities have been established in these areas and stove sales have picked up strongly in the second half of 2011 and the first semester of 2012. This is now the time where massive marketing campaigns can boost sales and set the EnDev 2 investments into capacity development into full value. A particular focus will be given to the promotion of the new charcoal stove éclair. This product has been developed over the last two years and has now reached the level of market introduction.

The promotional activities will introduce improved cookstoves and their advantages in terms of efficiency, speed of cooking and cleanness in the kitchen to a larger public. At the same time, a modern image is conveyed to generate the interest of customers to purchase such a stove. Through professional marketing campaigns, but also local actions, almost all of the people living in rural and urban areas covered will be reached in a limited time. Communication activities should be conducted on several issues, combining both traditional methods (sensitization, information meetings, plays) and modern (radio, spot advertising, posters, etc.). Experience has shown that these two actions can push a larger number of households to purchase improved cookstoves. This initial push will anchor the use of improved cookstoves in the household's habits to the extent that it meets the expectations of housewives. The grants for the advertising and marketing will also allow new producers to launch their business quickly enough and expand their business thereafter. However, sustainability issues need to be considered.

Main activities:

- design and implement large marketing campaigns for improved cookstoves specifically for each intervention areas;
- conduct outreach activities to promote improved cookstoves;
- develop and strengthen marketing systems;
- conduct awareness and training on good cooking practices in using improved cookstoves

Key intervention 2: Consolidation and targeted extension of production capacities in the new intervention zones of EnDev 2.

With the increased demand for ICS in the new EnDev 2 intervention zones (North-East and South) new challenges are to be addressed on the supply side. Producers have to cope with the scaling-up of their production capacities. Quality assurance will be one of the key requirements for EnDev in this phase. Targeted retraining of producers will be implemented if necessary.

Large marketing activities can trigger demand for the training of additional producers as the request of stoves may exceed existing production capacities or may target areas where no production capacities have yet been established. This "extension" of the program intervention zone will be based on baseline studies with market assessments in order to focus on high potential areas.

For the training of new producers, intervention packages for the selection, the technical training as well as on business aspects of stove production have been developed and elaborated over time. Targeted support for the start of the business (e.g. special tool kits) will be provided.

Quality assurance will be increased through a joint effort of EnDev staff, implementing partners and the involvement of the producers and their association. A gradual transition of this task onto the association will prepare the long-term phasing out of external support to the quality assurance.

Main activities:

- train producers in semi-industrial manufacturing techniques
- train producers and sellers in management and marketing of improved cookstoves
- support the creation of interest groups of producers
- support the introduction of quality control systems
- support the implementation of semi-industrial units
- promote improved energy efficient fuelwood kilns amongst the ceramic stoves producers
- facilitate cooperation with other organisations that support ICS

Key intervention 3: Continue phasing-out of the EnDev 1 intervention zone

Support for the first intervention zones has started six years ago. It was a learning process where different products, different types of interventions, different organisational set-ups and different marketing approaches have been developed and experimented with. Since the final reporting of EnDev 1, the annual stove sales in these villages have increased by 150%. Now it will be necessary to take measures ensuring these encouraging results can be sustained in the future. The development and introduction of phasing-out interventions will be coupled with the support for the promotion of the new éclair stove since continued innovation is a key element of sustainable markets.

In support of the above key interventions, maps based on Geographic Information Systems will be developed to effectively implement and assess the project activities in urban, peri-urban and rural areas. The power of GIS will be used to (i) create maps and graphics for reports, (ii) analyze and model information to make better decisions, (iii) view the project locations and provide timely information on the stove supply chain operators and the status of cooking energy access, (iv) analyze data for strategy or project development, (v) identify overlapping program and partner activities, (vi) visualize project indicators for monitoring and evaluation, and (vii) share information and better communicate with partners.

4.3. Approach to provide clean cooking technologies to households

Not relevant for this proposal

4.4. Approach to provide access to modern energy services for social institutions

Not relevant for this proposal

4.5. Approach to provide access to modern energy services to SME's

Not relevant for this proposal

5. Expected impacts of the project intervention

In general, the promotion of improved cookstoves has impacts in different dimensions as listed in the table below. However, EnDe-Benin is not implementing a territory-based approach with the intention to change every person living in a particular area. Hence an assessment of the impact cannot be focussed on the verification of territory based indicators (e.g. reduced rate of deforestation of a particular forest area).

EnDev-Benin is based on a sector oriented approach, improving the supply-demand systems of portable cookstoves. These stoves can be locally sold, but are also subject to long distance trade. Hence the impact of the stoves sold cannot be easily traced as the "impact area" is not so clearly defined (compared to a territory-based program).

The impact assessment is thus dependent on the assessment of individual change, which can be extrapolated for the total number of stoves currently in use.

Impact	Possible indicators
Environment	Reduction in average fuel use per household Assessment of percentage "unsustainable biomass" of the firewood used from target group in selected rural project villages
Health	Change in emissions of particulate matter and carbon monoxide per full cooking task (when changing from one stove type to another)
Poverty / livelihood	Change in jobs and small business creation Change in income generation through the production or commercialisation of improved cookstoves Amount of fuel expenses saved
Education	
Governance	

6. Budget

	EUR
1 Human resources and travelling	780,000
2 Equipment and supplies	155,000
3 Funding financing agreements / local subsidies	190,000
4 Other direct costs	597,722
5 Total direct costs	1,722,722
6 Mark up costs / administrative overheads / imputed profit	277,278
7 Cost price	2,000,000

Bolivia

Project phase	old: 10.2009 – 12.2014			new: 10.2009 – 12.2014		
Project budget	old: EUR 8,400,000			new: EUR 9,400,000		
Target groups	Rural households of Bolivia					
Expected outcome at project end					old target	new target
Number of people	Energy for lighting and electric household appliances				300,000	300,000
	Cooking energy for households				162,000	212,000
Number of institutions or enterprises	Electricity and / or cooking energy for social infrastructure				2,700	2,700
	Energy for productive use / income generation				11,200	11,200
Promoted technology	[ ] Solar	[ ] Biogas	[×] Stoves	[ ] MHP	[ ] Grid	[ ] Other
Summary of key interventions and outputs	Installation of 10,000 improved cookstoves in rural poor households. local capacity development and technology transfer: • trainings to local NGO and entrepreneurs regarding the construction of Malena stoves • trainings to households for use and maintenance alternative job creation: • local trainings to technicians in the provision and local manufacture of the non local stove materials (metal chimney and rack) • local trainings to technicians in installation, use and maintenance of Malena stoves awareness creation: • health, deforestation and safety matters are part of all interventions regarding the use of an improved cookstove.					
Coordination with other programmes	World Bank program (IDTR)					
Lead political partner	Viceministry of Electricity and Alternative Energy (VMEEA)					
Implementing organisation	GIZ					
Implementing partners	Viceministry of Electrictiy and Alternative Energy - Program of Electricity for a decent Living					
Project manager	Name: Jaime Sologuren Mail: jaime.sologuren@giz.de					

1. Situation analysis

Bolivia's efforts to improve delivery of energy services to the poor have been quite intensive in recent years. However, it should be noted that while the scale-up of energy programs in rural areas is particularly desirable, it is also extraordinarily costly in the Bolivian context: Bolivia has the lowest population density and one of the most difficult geographical conditions in Latin America.

Bolivia has an extensive and complex social, ethnic and cultural background, and suffers from high levels of poverty and social exclusion, which affect the majority of the indigenous population, women and children particularly. After years of weak economic growth, the Bolivian economy has been showing signs of recovery since 2003. However, national poverty reduction policies need to be strengthened and implemented effectively in order to achieve a fairer distribution of the benefits of growth for the most vulnerable sections of the population.

1.1. Energy situation

Traditional biomass (wood, dung, charcoal and green residue) accounts for 30.74% of primary energy consumption inside the household and is the second most important source of energy after LPG. This is mainly due to the important role of biomass for the energy supply in the country's rural areas. Traditional biomass represents nearly 90% of total energy consumption by rural households and is predominantly used for cooking (70%); the remaining 10% of total energy consumption are used for lighting. In the year 2009 close 53.1% of rural households met their energy demands for cooking from biomass sources (firewood and dung, principally). The access to it in some regions of the country is becoming scarce so people have to walk longer distances every day in order to find their daily primary fuel. Biomass provision in these areas is unsustainable. In many regions the wood availability has become so scarce that households have to buy it at high prices.

Access to cleaner fuel such as LPG for cooking is not regular in rural areas: access by roads is often difficult and prices in places with high levels of poverty are often prohibitively high. These framework conditions lead many rural households to continue the use of the firewood.

1.2. Policy framework, laws and regulations

Under the socialist government of Evo Morales Bolivia has seen profound changes in many policy fields. The energy sector is undergoing huge changes with the introduction of two new laws that will change many important aspects of the sector regarding electricity and hydrocarbons. This introduction of a new regulatory framework, although initiated, is a process that will need a lot of time in order for the required norms and regulations to be elaborated and promulgated. However the tendency is clear: a move towards a more centralist state with programs under direct execution of the central government and its ministries.

The major challenges identified were (1) access to adequate technologies for better cooking conditions in rural areas, (2) creation of a clear legal framework, and (3) building of qualified and well-trained human resources. These are now being addressed at national and regional levels across the country.

The EnDev project has been closely working with the VMEEA, other viceministery offices, the university and private actors in order to develop a National Norm for the technical specifications of improved cookstoves. The norm has been approved and the project and partners are promoting its application to all improved biomass stoves in the country.

The government puts a strong emphasis on public health through efforts in sanitation, better health infrastructure, and coordination with donor programs that are working on the improvement of public health in rural areas. The state also working towards the "Vivienda Saludable" ("Healthy Dwelling"); a concept which includes better insulation, space heating, and improved cookstoves.

1.3. Institutional set-up in the energy sector

In Bolivia, the Viceministry of Electricity and Alternative Energy (VMEEA), within the Ministry of Petroleum and Energy (MHE), is in charge of establishing policies and designing the regulation for the electricity sector. The VMEEA and the Viceministerio de Desarrollo Energético (VMDE) are in charge to develop policies to promote energy efficiency and renewable energy. A working group of VMDE and VMEEA, the "Unidad de Desarrollo Energético", develops the National Plan for Rural Electrification.

The “Autoridad de Electricidad (AE)” is responsible for applying the regulation set by the VMEEA and it grants and supervises concessions of electricity operation and maintenance. It works with the “Comité Nacional de Despacho de Carga (CNDC)”, which coordinates the activities of the actors in the three markets (generation, transmission and distribution) under the interconnected system. The CNDC consists of delegates of the relevant companies in the sector. As in other countries, Bolivia’s electricity sector consists of National Interconnected System (SIN) and off-grid systems (known as the Aislados).

The electricity sector in Bolivia was privatized in the early 1990s and was unbundled into generation, transmission and distribution. However, with the new government, all companies in the market are being nationalized and state controlled by the national electricity enterprise called ENDE; creating insecurity for private investment.

1.4. Major donor activities

EnDev has a strong coordination with the future World Bank program “Infraestructura Descentralizada para la Transformación Rural (IDTR)”, which plans to install 10,000 stoves in the country. The present upscaling proposal is in accordance with the WB strategy in terms of subsidy levels and implementation strategy. This program as scheduled to start end of 2013, when this activities of this up-scaling proposal will have been completed.

2. Planned outcome

Energy service segment	Old targets		New targets	
Energy for lighting and electric household appliances	300,000	people	300,000	people
Cooking energy for households	162,000	people	212,000	people
Electricity and / or cooking energy for social infrastructure	2,700	institutions	2,700	institutions
Energy for productive use / income generation	11,200	enterprises	11,200	enterprises

3. Project approach

3.1. Energy technologies and services promoted by the EnDev project

EnDev has in the past been working on the development of an improved cooking technology that suited to the demand of rural families. At the same time, the technology was required to support the creation of a market for improved biomass stoves. Today a point has been reached where the mud and metal stove called “Malena” has proven to fulfil these criteria. It is very well-accepted by the target population.

3.2. Approach to provide electricity to households

Not applicable for the present up-scaling proposal.

3.3. Approach to provide clean cooking technologies to households

EnDev's approach will remain largely the same with the overarching objective of increasing the number of people with sustainable access to modern energy while combating poverty and climate change, as well as promoting gender equality, economic growth, environment protection and private sector development.

The key intervention of EnDev is the creation of a viable market structure for improved biomass stoves by stimulating demand and promoting local supply.

In terms of strengthening supply, EnDev will continue to establish and reinforce alliances with different placer. The objective is to scale-up the introduction of improved cookstoves through a market approach in which suppliers are contracted to introduce their work in the field. Local subsidy agreements will be signed with these NGOs or enterprises. They will receive the chimney and the grille (rack) from EnDev. Payments will only be made once the stove is installed and verified by EnDev by means of sample visits. Contracts will include:

- Selection and training of local "Malena stove" constructors (men or women) at community level that can build the stove. Training will also include maintenance such that the persons trained can in the future provide maintenance for the stove in the household.
- Implementation of a baseline survey on energy consumption for cooking activities in each household prior to the installation
- Household training for use and maintenance of the stove, good cooking practices, proper lighting, cleaning, etc.

In order to promote massive improved cookstove commercialization, the project's aim also is to introduce a low cost stove with chimneys through local NGOs and technicians. The direct subsidy is in the range of EUR 40-55 per stove; this includes all material needed to build the Malena stove and also all field installation costs.

In parallel, EnDev will train local technicians on replacement of the chimney and metal rack. EnDev will also work with local manufacturers to further build capacity on the design of Malena stoves, especially the local provision of the metal chimney and rack. Promotion and awareness activities are part of the support to locale technicians – the objective is to stimulate rural demand for improved cookstoves. This support to the sales structure includes the technicians already trained by EnDev, linking them with the local chimney and rack providers.

EnDev will also support other types of stoves produced by small entrepreneurs (metal stoves) if they pass the required standards established under the Norm N° 83001. This will attract new entrepreneurs interested in stove dissemination. Testing will occur in the stoves testing center established with support by EnDev at the public University of San Andrés in La Paz. Every single model shall be tested and certified before sale.

On the demand side, the project will work closely with rural communities where high demand has already been identified. Promotion of the technology (benefits and advantages), awareness creation and support to the suppliers in order to reach and be able to fulfil the demand will create positive framework conditions for massive distribution of improved cookstoves.

EnDev will also keep its focus on provision of technical assistance for capacity development about cookstoves within counterparts at different levels and implementing partners within national, regional and municipal governments. Knowledge on the advantages of improved cookstoves will spread, thus also contributing to higher demand.

The project will continue to monitor, evaluate and report within the monitoring and evaluation system already in place.

It is important to note that the strategy for this upscaling proposal was designed in close co-operation with the World Bank and that it will be continued by the joint World Bank / VMEEA program which is expected to begin end of 2013. Thus, duplicity or overlaps are avoided.

3.4. Approach to provide access to modern energy services for social institutions

Not applicable for the present up-scaling proposal.

3.5. Approach to provide access to modern energy services to SME's

Not applicable for the present up-scaling proposal.

4. Expected impacts of the project intervention

Impact	Possible indicators
Environment	Less pressure on the environment (wood): percentage of households with improved cookstoves that use less firewood to cook. Green House Gas mitigation by reducing products of incomplete combustion: CO_2 equivalent decrease due to the use of an improved cookstove.
Health	Decreased IAP and thus respiratory problems and eye diseases: CO and PM (PM 2.5 and PM 10) reduction in concentration in the kitchen following use of a certified improved cookstove. Cleaner air in the household: percentage of households that perceive there has been a reduction in health problems that were caused by the use of fuels in inefficient systems for cooking. Increase safety: number of accidents after the stove installation.
Poverty / livelihood	Improved living conditions: percentage of household members' perception. Income generation: new or existing productive activities. Alternative job creation activities. Savings in energy expenses. Market creation for technology producers: number of enterprises with a demand for improved cookstoves.
Education	Technology transfer trainings to rural technicians: ratio trained technicians vs. technicians installing stoves. Awareness creation for men and women regarding benefits of indoor health, safe and hygiene benefits from the use of an improved cookstove.
Governance	Introduction of improved cookstoves projects under national, regional or municipal social programs: programs with stoves components. Introduction of the Norm 83001 as a mandatory regulation under the Viceministry of Household programs: TORs for programs.

5. Budget

	EUR
1 Human resources and travelling	150,000
2 Equipment and supplies	80,000
3 Funding financing agreements / local subsidies	600,000
4 Other direct costs	83,340
5 Total direct costs	913,340
6 Mark up costs / administrative overheads / imputed profit	86,660
7 Cost price	1,000,000

Burkina Faso

Project phase	old: 10 / 2009 – 12 / 2014			new: 10 / 2009 – 12 / 2014		
Project budget	old: EUR 1,500,000			new: EUR 3,500,000		
Target groups	Rural, peri-urban and urban households, professional users (for beer, shea butter, "soumbala" spice), Schools and Health Centres					
Expected outcome at project end					old target	new target
Number of people	Energy for lighting and electric household appliances				0	0
	Cooking energy for households				300,000	500,000
Number of institutions or enterprises	Electricity and / or cooking energy for social infrastructure				450	1,000
	Energy for productive use / income generation				4,500	6,000
Promoted technology	[ ] Solar	[ ] Biogas	[×] Stoves	[ ] MHP	[ ] Grid	[ ] Other
Summary of Key interventions and outputs	Key intervention 1: Expanding household stove promotion into new villages and small towns Key intervention 2: Consolidation of the supply-demand systems established in the rural intervention areas of the current phase in preparation of a "phasing out" Key intervention 3: Follow-up of producers in Ouaga and Bobo on their performance after the phasing out of project support Key intervention 4: Piloting éclair charcoal stove from EnDev-Benin and - if found suitable - scaling up of the technology in relevant markets Key intervention 5: Promotion of large scale devices for school canteens in new areas Key intervention 6: Promotion of large scale devices for commercial applications in new areas Key intervention 7: Piloting support to fuelwood tree plantation to increase the use of "sustainable biomass" Key intervention 8: Introduction of agrowaste fuel for productive and household use					
Coordination with other programmes	SNV stove program PASES (World Bank) stove program UNIDO stove program					
Lead political partner	Ministry of Environment and Sustainable Development					
Implementing organisation	GIZ					
Implementing partners	Stove producers associations, IRSAT, private sector (PR specialists)					
Project manager	Name: Dr. Andrea Reikat Mail: andrea.reikat@giz.de					

1. Situation analysis

1.1. Energy situation

More than 80% of the energy supply in Burkina Faso is provided by biomass (wood and charcoal). In rural areas, biomass energy accounts for nearly 100%. The national average daily firewood consumption per person is 0.69 kg, but in some areas it goes up to more than 1 kg (depending on availability of firewood and humidity of the wood).

The North of the country is part of the Sahelian Zone of West Africa and therefore more vulnerable to deforestation effects. However, even the Central and Southern Regions of the country are also experiencing deforestation. This is caused by two effects: on the one hand these areas are supplying firewood and charcoal to the country's capital. On the other hand, it is in these regions where commercial production of beer, shea butter and other agro-products consume a lot of biomass. In some areas, these commercial usages of cooking devices account for more than 50% of wood consumption – with a rising tendency due to, e.g., the expanding export market for shea butter.

The main alternative energy for household cooking is gas: but while the ownership of gas cooking equipment in big towns is reaching nearly 35% (and in smaller towns is still some 10-25%), gas only accounts for 0.4% of the overall cooking fuel consumption due to the insufficiency and unreliability of gas provisions. Cooking with gas is quite economical for households at present. However, prices are likely to rise considerably from 2013 because of the announced removal of the subsidy which has, until now, been responsible for its low price.

For the last 40 years or more, a simple metal stove (called "le Malgache") is the main baseline stove used for burning wood and charcoal in urban households. This stove is produced by blacksmiths locally in small workshops from retailed metal materials and costs around EUR 1-1.50. In rural households, cooking and agro-processing is still mostly done on an open fire.

Better cooking technologies have thus to compete with these alternatives which are either free or very cheap. In addition, the improved cookstoves have to meet the specific needs of the Burkinabé cooking habits: the daily staple food is a millet porridge that has to be "beaten" during preparation – the stove thus must be shallow and stable. Traditional beer preparation takes two days, which requires the stoves to be resistant to permanent heat exposure.

The improved cookstoves conceived in Burkina Faso during the 1980s and further improved during the last years (beer and shea butter stoves) take these aspects into account: the household stoves are low and quite cheap; the professional stoves are very heat resistant. For the moment, other improved wood and charcoal stoves on the international market that could eventually be imported are found not to be adapted to the cooking habits neither for domestic nor for professional use. For the same reasons, the existing solar and plant oil cookers cannot be promoted in Burkina Faso in considerable numbers. However, the new charcoal stove developed by EnDev in Benin is based on the Roumdé stove body of Burkina Faso. At the same time, its performance can be compared to industrially produced charcoal stoves like the Prakti Rouge stove from India. There is a good chance that the "éclair" from EnDev-Benin might also be successful in Burkina Faso.

1.2. Policy framework, laws and regulations

Since 2010, the "Strategy for Accelerated Growth", developed and promoted by the World Bank, is the new main document to guide the country's development. It emphasises the need for "sustainable development" in a more profound and prominent manner than in the previous Poverty Reduction Paper and country strategy papers.

Nevertheless, Burkina Faso has been one of the first countries in West Africa having adopted, with the support of CILSS / PREDAS, a national strategy for domestic energy. But this

strategy only mentions improved cooking technologies without giving any concrete guideline regarding their introduction. The charcoal sector was reorganized by the government in 2005 and is based on franchising production in some defined production areas.

Despite the existence of guidelines for the cutting of fresh wood, there is little effective control both on domestic and commercial level due to lack of effective structures on the ground and corruption.

1.3. Institutional set-up in the energy sector

Since the 1970s, Burkina Faso has been one of the leading countries in the sub-region regarding the development and dissemination of improved cookstoves. As a result, the country disposes today of a huge experience in terms of technology and a considerable choice of adapted stove types is available. The non-sustainability of the multitude of projects having intervened in the sector since the 1970s can be explained by the fact that most of them have been donor or state driven and that they relied on subsidies – achievements vanished when the donor retired and the subsidies were phased out or stately politics changed (e.g. after the "revolution" in the 1980s).

There is also a constant quarrel between several government departments (mainly the Ministries of Environment on the one hand and the Ministry of Energy on the other) concerning the responsibility for the introduction of improved cookstoves. In consequence, neither of them really assumes this role or is equipped with the (personal and financial) capacities to do so.

Adding to this confusion in the institutional set-up is IRSAT, the "Institute of research in Applied Sciences and Technologies. The very competent, but under-equipped, state owned research institute on cooking energy works is under the auspices of the Ministry of Research. This institute also holds the legal authority for accrediting stoves and for defining standards. But it clearly has no capacities (and no ambitions) in stove dissemination.

To establish a sustainable supply / demand system, FAFASO has, since 2006, fully relied on the private sector and followed a purely commercial approach, counting on the producers' interest in earning money by selling quality stoves and on the user's interest in the stoves' advantages.

1.4. Major donor activities

In February 2008, the Ministry of Energy of Burkina Faso started an Energy program (PASE) financed by the World Bank and integrating (amongst electrification and reforestation) also a stove component. After years of discussion between PASE and FAFASO on possible modes of cooperation, PASE executed, in 2011, some stoves sales events with producers trained by FAFASO and then installed, in December 2011, a production unit of Kenyan Jiko stoves in Ouagadougou.

The household energy program of CILSS (PREDAS) has restarted activities in 2011, but has – to our knowledge – no practical component on stove dissemination.

From end 2010 onwards, FAFASO has been in discussion with SNV on the development of a stove component. Based on a market assessment, SNV decided to engage in the dissemination of beer stoves in one of Burkina Faso's regions (the "Boucle de Mouhoun"). A first training for stove builders is planned for end September 2012. There are on-going negotiations concerning a partnership agreement between SNV and FAFASO.

UNIDO is equally planning a beer stove component. FAFASO has supported the concept development of the proposal and might become involved in its implementation.

Since 2009, a number of initiatives have been developing CDM projects in the country. The most concrete projects are submitted by two of FAFASO's former partners: New tree, a Swiss NGO, having worked so far in the dissemination of mud stoves in villages; and "Entrepreneurs du Monde", a French NGO, working up to now in the support of Microfinance insti-

tutions but now willing to accompany the entire process of stove dissemination. It remains to be seen to which extent they will succeed in creating a functional system of production and dissemination of stoves. FAFASO has to observe this development because of the potential use of direct end customer price subsidies often applied in carbon market projects.

2. Planned outcome

Energy service segment	Old targets		New targets	
Energy for lighting and electric household appliances	0	people	0	people
Cooking energy for households	300,000	people	500,000	people
Electricity and / or cooking energy for social infrastructure	450	institutions	1,000	institutions
Energy for productive use / income generation	4,500	enterprises	6,000	enterprises

3. Project approach

3.1. Energy technologies and services promoted by the EnDev project

FAFASO has promoted household stove models which have been developed in the 1980s since its beginnings in 2007. While these stoves – technically speaking – may not be state of the art (particularly with respect to emission reduction), they are highly adapted to the needs of the target group in terms of cost / benefit and cooking needs aspects. FAFASO will continue to promote these stoves.

The new charcoal stove ("éclair") from EnDev-Benin will be tested and piloted. Based on the results of the pilot, the stove might be promoted in suitable markets. The promotion of the éclair would allow FAFASO to reduce both fuel consumption and CO emission of its charcoal stoves. However, charcoal as a fuel is not as common in the cooking energy sector.

Beyond household cooking, FAFASO has improved the large stoves for canteens and for commercial processing of agricultural products (e.g. beer brewing, shea butter etc.) in the last years. Large stoves offer a much higher potential in wood fuel savings per unit as compared to household stoves (more than twice the savings). While FAFASO was concentrating on household stoves in the last years, the successful piloting of the devices for productive applications has prepared the ground for further developing this sector.

In this context, two different types of shea butter stoves have been developed in cooperation between FAFASO and IRSAT and have been tested in the lab and in field during the 1st semester of 2012. One of these stoves can be used exclusively with shells of shea butter nuts, thus reducing the wood consumption to nearly zero at least for the buttering process. With this new development, the topic of alternative (agrowaste) fuels which had already appeared on the agenda in 2008 / 09, has re-appeared and should be pushed forward during the two years to come.

3.2. Approach to provide electricity to households

Not relevant for this proposal

3.3. Approach to provide clean cooking technologies to households

Key intervention 1: Expanding household stove promotion into new villages and small towns

Since 2006, FAFASO has trained stove producers in all of the country's 13 regions, but in nine of them, these were not yet further supported by any intervention (e.g. on marketing). Within these nine regions, there are seven which are especially vulnerable to deforestation:

1. The three northern regions (North, Center-North and Sahel) due to their geographical situation near to the Sahel. These regions can be covered, from January 2012 on, by a co-financing achieved from the European Union's 2nd energy facility.
2. The Boucle de Mouhoun that also reaches, at least in its northern part, into the sahelian regions. For this region, a partnership agreement is under way with SNV who wants to disseminate improved millet beer stoves. Nevertheless, for the household stove sector, an implication by FAFASO would still be preferable. In this sense, FAFASO's former agent for Bobo Dioulasso has just moved to the region's capital Dedougou to boost activities there.
3. The Centre-West, Center-South and Center-East regions are especially vulnerable for three reasons:
    - It is from these regions that the majority of the wood (and charcoal) reaching the capital comes from. The higher purchase power in Ouagadougou accelerates the drain of biomass from these regions into the capital. And even if the potential in biomass there is quite good – compared to the country's average – the population suffers from high prices and / or longer collection times.
    - In these regions much millet beer is produced and consumed. In some parts the millet beer production accounts for more than 50% of the overall wood consumption.
    - Additional forms of productive use can be found here, i.e. production of shea butter and soumbala (a spice).

The combination of these factors leads to an enormous pressure on biomass resources. The introduction of improved cookstoves for household use is thus not only necessary but the population becomes more and more aware of the issue.

An EnDev sustainability study showed that "roumdé" stoves are well-known even in parts of regions where FAFASO never implemented any activities (53% for the city of Po, study from June 2012). FAFASO can thus rely on achievements of its former national awareness raising campaigns and there is good reason to believe that considerable results can be obtained until December 2014.

The activities to be implemented follow the elaborated FAFASO framework and consist of:

- producers' trainings (for metal and ceramic stoves, two of the regions having a quite good reputation for their ceramic production)
- awareness raising activities on local level (cooking demonstrations, sales events, radio emissions etc.)
- strengthening of the commercial chains.

Key intervention 2: Consolidation of the supply-demand systems established in the rural intervention areas of the current phase in preparation of a phasing out.

Since 2008, FAFASO has been very active in the two rural regions which are German Cooperation's priority in the country (the Southwest and the East). FAFASO has been able to achieve huge progress in the commercial dissemination of household ICS in small cities and rural areas.

Until 2014, it is foreseen to initiate the step-by-step phasing out process of the direct support to the producers following the experiences made in the EnDev 1 intervention zones

Key intervention 3: Follow-up of producers in Ouaga and Bobo on their performance after the phasing out of project support.

Since the beginning of its activities in 2006, FAFASO has focussed on the dissemination of improved cookstoves particularly in the country's two big cities, Ouagadougou and Bobo Dioulasso. In an intensive process starting 2008, the producers in these cities have been supported to organize themselves in associations in order to prepare them for the time after the project's retirement from its direct support. Hence they have been more and more involved in the project's activities like quality control and marketing. Between the end of 2011 and the beginning of 2012, the producers' associations received all necessary materials required for the execution of all activities concerning the stove production and dissemination. From 2013 FAFASO will restrict itself to observe the appropriate use of this material, but will not be actively involved any longer (except for a potential introduction of the éclair stove model).

Key intervention 4: Piloting éclair charcoal stove from EnDev-Benin and – if found suitable – scaling up of the technology in relevant markets

Over the last two years, EnDev-Benin developed a new charcoal stove which is based on the roumdé stove body from Burkina Faso. It has shown good results in the lab for reductions in specific fuel consumption, CO emissions and the time to boil. As the cooking situation in Benin is very similar to Burkina Faso (same shape of cooking pots, same type of baseline stoves, same type of producers), there is a good chance that the stove model can be also successful in Burkina Faso. This would allow FAFASO to promote a stove with low emissions which is respecting the user's preferences in terms of shape, cost and performance. The technology will be tested in the lab and the field for verification and (if required) adjustment before a roll-out will be decided upon. As the larger cities are the major market for charcoal stoves, this would mean that cooperation with the producers in Ouaga and Bobo would have to be reinitiated for the introduction of this new product. While this may be contradicting the idea of phasing out the EnDev 1 areas, it is of higher importance to guide innovations to suitable markets.

Key intervention 7: Piloting support to fuelwood tree plantations to increase the use of sustainable biomass

So far, EnDev did not support the fuel supply side intervention of the biomass energy sector in Burkina Faso. The project's national partner, the Ministry of Environment and Sustainable Development, is strongly supporting the idea of piloting activities which could increase the proportion of sustainable biomass used in the EnDev-supported technologies. However, being a new component, the approach will have to be developed and tested. Especially, family-based reforestation models will be tested and evaluated to assure better care for the plants.

Focus will be given to the collaboration with professional wood fuel users. Areas targeted are those which supply the capital city and commercial fuelwood users.

Activities will also focus on building up a commercial approach from raising tree seedlings in nurseries up to tree planting, raising and woodlot management. While this may contribute to building up another income generating sector, impacts on the percentage of sustainable biomass in the overall fuel use will not be observed within a project period of two years.

3.4. Approach to provide access to modern energy services for social institutions

Key intervention 5: Promotion of large-scale devices for schools in new areas.

Produced in bigger dimensions, the household metal stoves promoted by FAFASO are also suitable to school canteens and other institutions. Nevertheless, the commercial dissemination of these stoves in schools is difficult as it is the parent's associations that are responsible for the equipment of the school canteens, i.e. the persons that have to give the money are different from those who benefit from the stoves (not only fuel economy, but also reduction in heat and smoke exposure). An initiative taken by the School ministry in 2010 making improved cookstoves in primary schools mandatory (FAFASO was involved) didn't show any

effect. FAFASO thus organized a workshop in the end of 2011 bringing together parliament members and representatives of social and economic institutions advocating for the use of improved cookstoves in school canteens. As a result, some 265 schools have been equipped up to the end of the last school year. Regarding the fact that most social institutions weren't been able to react at the end of the school year as budgets already had been closed, an even bigger dynamic can be expected for the new school year.

Even if this is good news, the sustainability of the approach is not assured as it currently rests on parent's contributions. Parents may be aware of the importance to replace the improved cookstoves after their lifespan, but it is not sure that stove replacement will actually happen. A real step towards sustainability would be achieved if parliament voted for an obligation to use improved cookstoves in schools. This had been evoked after the workshop.

Targeting a second sector of social institutions, negotiations with the Ministry of Health and NGOs will be undertaken in 2013 / 14 to promote the equipment of health centres with improved cookstoves. Especially in rural areas, patients and their caretakers often stay away from home for a long time for medical treatment and usually it is up to the relatives to prepare the meals not only for themselves, but also for the patients. Installing improved cookstoves in these centres could thus not only have an effect on the wood consumption and the heat reduction for the users, but it would also help to make known the advantages of improved cookstoves to people coming from the remotest parts of the country.

3.5. Approach to provide access to modern energy services to SME's

Key intervention 6: Promotion of large-scale devices for commercial applications in new areas

Since 2008, FAFASO has worked in the dissemination of improved cookstoves for productive use, initially for the production of millet beer. Millet beer production accounts for about the half of fuelwood consumption in some parts of the country. The latest improved beer brewing stove model can save between 50% (in comparison to a half-improved cookstove developed in the 1980s and being the reference stove in big cities) and 80% (in comparison to the 3-stone-fire, still being standard in most rural parts of the country).

Concerning shea butter and soumbala production a stove has been developed by IRSAT with FAFASO support during the last two years. The latest model shows a wood economy of 44% in the laboratory and has been presented to some producers' associations in June 2012. FAFASO can thus offer suitable stoves for the three major productive uses (in terms of biomass consumption) and especially in the three regions newly to be covered.

All these stove types are masonry work: in the case of the millet beer stoves the bricks are covered with mud, in those of the shea butter- and soumbala stoves with cement. This causes different costs: while the millet beer stove can be built for approximately EUR 40 and is thus affordable to the individual beer producer (who, actually, can compensate the costs generated by the stove purchase within two weeks), the shea butter and soumbala stove costs around EUR 150 and is thus more suitable for producers associations.

The respective dissemination models have to take this into account, i.e. in the case of the shea butter and soumbala stoves, a stronger emphasis must be put on microfinance models. In addition, shea butter and, to a lesser extent, soumbala production rely more on associative structures that are also in charge of the product's sales which in turn facilitates access to credits.

Nevertheless, the producers of the two stove types would be the same and synergies in the trainings can be realized.

Key intervention 8: Introduction of agrowaste fuel for productive and household use

Huge amounts of shea nut shells, showing high calorific value, are a sideproduct of shea butter production. Whereas tests with IRSAT to compact the shells in a way that they can be used for household stoves have not been conclusive, one of the new shea butter production

stoves brings the topic back on the agenda as it can be used with nut shells as the sole fuel. In parallel to the introduction of this stove type, the introduction of nut shells (and eventually also other types of agrowaste) as fuel will be re-integrated into the awareness raising work of EnDev.

4. Expected impacts of the project intervention

Impact	Possible indicators
Environment	reduction or, at least, stabilization of fuelwood extraction from the main areas of delivery (statistics of Ministry of Environment)
Health	reduced exposure to smoke and heat in the kitchens and productive units using improved cookstoves (IAP meter studies)
Poverty / livelihood	at least 10% more disposable money for productive users of improved cookstoves (studies)
Education	
Governance	at least one parliamentary decree making improved cookstoves mandatory for schools at least five decrees from different town council introducing improved cookstoves in wedding ceremonies or making them mandatory for certain productive use (beer brewing) at least three MoU with NGOs supporting shea butter production for the introduction of economic cooking devices for shea butter production at least three MoU for international enterprises (e.g. mining) introducing ICS in the households or SI covered by them

5. Budget

	EUR
1 Human resources and travelling	1,350,000
2 Equipment and supplies	915,000
3 Funding financing agreements / local subsidies	75,000
4 Other direct costs	655,541
5 Total direct costs	2,995,541
6 Mark up costs / administrative overheads / imputed profit	504,459
7 Cost price	3,500,000

Burundi

Project phase	old: 09 / 2010 – 06 / 2013			new: 09 / 2010 – 12 / 2014		
Project budget	old: EUR 900,000			new: EUR 1,500,000		
Target groups	Rural, peri urban and urban poor households					
Expected outcome at project end					old target	new target
Number of people	Energy for lighting and electric household appliances				11,000	11,000
	Cooking energy for households				0	120,000
Number of institutions or enterprises	Electricity and / or cooking energy for social infrastructure				12	12
	Energy for productive use / income generation				150	150
Promoted technology	[×] Solar	[ ] Biogas	[×] Stoves	[ ] MHP	[ ] Grid	[ ] Other
Summary of key interventions and outputs	Key interventions: • Enhance cookstove production capacity of the stove makers in Burundi and Eastern DRC • Promote sustainable marketing structures for fuel-saving charcoal stoves in the major urban and peri urban areas in Burundi and E-DRC • Training of communal staff / management committee as owner and supervisory body operation and maintenance of PV systems • Co-financing of the installation of PV-systems for the electrification of key communal services: schools, health centres, town halls, solar street lights and solar powered energy service stations (ESS) • Setting up sales and maintenance shops attached to SI for SL, SHS, batteries Expected output: • 100 PV-powered ESS established • twelve social institutions (schools, health centres, city halls) equipped with PV • 30 Solar Street lights installed • 1,350 pico PV Lanterns disseminated • one NGO strengthened to implement stove projects successful • 40,000 improved cookstoves in use					
Coordination with other programmes	SEW: Sustainable Energy production through Woodlots and agroforestry in the Albertine Rift. (DGIS)					
Lead political partner	Ministry of Mines and Energy in Burundi Ministry of Environment in RD Congo					
Implementing organisation	Rural electrification: GIZ Stoves: IFDC in cooperation with GIZ					
Implementing partners	Stove producers, private sector					
Project manager	Name: Rüdiger Wehr			Mail: ruediger.wehr@giz.de		

1 Situation analysis

1.1 Energy situation

Biomass

The biomass sector is a vibrant one: almost 300 tons of fuelwood and 1,000 tons of charcoal enter Bujumbura province every week. According to an IFDC survey, 98% of the households in the capital city rely on charcoal for cooking; firewood plays a minor role in urban areas while LPG is (too) expensive since it has to be imported into this landlocked country. It is expected that this situation will hardly change for the next 15 years, and that the demand for biomass fuels will remain high.

In rural areas wood and agricultural wastes are the predominant cooking fuels.

The annual turnover of the biomass energy sector in Burundi is around EUR 7.6 million, out of which EUR 7.2 million are attributed to charcoal and EUR 0.4 million to firewood.

The rate of consumption is estimated to be three times higher than new plantation. Deforestation thus is a serious problem: between 1990 and 2010 Burundi lost 40% of its forest. According to the FAO at present 6.7% or about 172,000 ha of Burundi are still forested, of which a quarter is classified as primary forest, the most biodiverse and carbon-dense form of forest.

Electricity

Only 2% of Burundi's population is grid-connected; in Bujumbura over 80% of all households have a grid connection, but electricity supply is erratic. With an installed power generation capacity of 30.6 MW, demand exceeds supply and load-shedding is frequent. The deficit varies between 13 MW in the wet and 24 MW in the dry season when hydropower plants are running at reduced capacity, leading to frequent outages – on average 12 days a month. Many firms in Burundi have their own back-up generator, or share access to one, which typically costs 0.3-0.4 EUR / kWh, cutting into profits and reducing the ability of local business to compete in regional and international markets. Power cuts are considered one of the key obstacles for economic growth. Electricity demand is expected to continue to rise as economy picks up, returning refugees re-establish themselves and living-standards increase. Peak demand is during evening hours and emanates mainly from household lighting needs.

Lack of maintenance and the supply deficit imply that the quality of service and operation of the national grid is insufficient. Estimated grid losses are 20-30%. Technical losses make up a large portion given the poor condition of the entire network.

The quality of the electricity delivered is poor: variations in frequency and voltage and the lack of adequate grounding and protection cause occasional high voltage surges, destroying consumer equipment and appliances.

DRC (North and South Kivu)

Goma and Bukavu are the capitals of North and South Kivu respectively. The population in both towns grows rapidly, creating ever more pressure on forest resources: Goma's population nearly tripled between 1994 and 2006 from just 200,000 to well over half a million. Bukavu's population rose by 40% to 700,000 in just three years since 2007.

Urban cooking is largely based on charcoal; in Bukavu, weekly charcoal consumption is estimated at 1,000 tons, similar to Bujumbura's, despite its bigger population. Goma's weekly household charcoal consumption amounts to approximately 1,250 tons. Electricity coverage for households in the DRC is very low, while electricity is mostly used for lighting, TV and radio and provided through gensets. Exact data for Eastern DRC are not available.

1.2 Policy framework, laws and regulations

There is no regulatory framework for biomass energy in place, neither in Burundi nor in the DRC. The Kivu regions are also far away from the DRC's capital Kinshasa and governmental supervision thus is not effective. This leads to rapid depletion of natural resources.

Following the Rwandese example of developing a Biomass Energy Strategy (BEST), IFDC took the initiative in Burundi to support the Ministry of Mines and Energy to restart the process for a BEST study for Burundi. The rationale was that sound energy policy is more accurate when it is based on validated data, while existing data clearly show knowledge gaps.

1.3 Institutional set-up in the energy sector

Burundian government

There is no clear driver of biomass energy issues in Burundi; two ministries are involved:

The lead on energy is in the hands of the Ministry of Mines and Energy (MEM). In the "policy letter on energy" MEM asked IFDC to look into charcoal matters.

The Ministry for Environment, Land Management and Urbanism (MEEATU) is another stakeholder. They regulate the forestry sector, and work side by side with the Ministry of Energy, but an effective coordination structure is not present yet.

In 2012 a sector group was established to enhance interministerial coordination.

GIZ-IFDC Cooperation

The Sustainable Energy through Woodlots project: In 2011 IFDC signed a MoU with EnDev-Burundi to collaborate on improved cookstoves. This MoU enabled IFDC staff and partners in the ICS program to benefit from GIZ capacity based on long-standing experience in the ICS sector. IFDC sent staff for training, received GIZ experts for in-country training and surveys and benefits from the extended GIZ-network.

Cooperation Université du Burundi and Leuven University

The Leuven University is supporting the Université du Burundi in knowledge transfer and scenario building in fuelwood supplies. IFDC signed a contract to support students from both universities jointly in studies on geospatial analyses on woodlot and biomass supply.

University of Graben, Butembo, North Kivu

The university offers its experience in studies and surveys related to forest and forest management. Concerning savings of firewood through ICS use, this will be measured both in hectares saved and in energy. The University of Graben will also host a stove testing laboratory (emission and efficiency measurements).

CREEC

CREEC (Center for Research on Energy and Energy Conservation) is the only existing and functional test lab for stoves in the region and recognized by the Global Alliance for Clean Cookstoves. CREEC played a role in identifying the best existing stoves in the beginning of the intervention of SEW and will test the promoted stoves.

1.4 Major donor activities

In Burundi and DRC, several minor and short term projects in the cooking energy sector are supported by various donors. Most of these tackle cooking energy in refugee camps and do not consider private sector development. Until now there is little or no coordination between these projects.

- UNDP: United Nations Development Program
- FAO: Food and Agriculture Organisation of United Nations
- WWF: World Wildlife Fund
- Mercy Corps
- SNV

- Burundian Red Cross

2 Planned outcome

Energy service segment	Old targets		New targets	
Energy for lighting and electric household appliances	11,000	people	11,000	people
Cooking energy for households	0	people	120,000	people
Electricity and / or cooking energy for social infrastructure	12	institutions	12	institutions
Energy for productive use / income generation	150	enterprises	150	enterprises

3 Project approach

3.1 Energy technologies and services promoted by the EnDev project

The approach of the Sustainable Energy through Woodlots (SEW) project is to work on the whole wood value chain – from promoting reforestation as a business to the use of charcoal and energy efficient cooking.

One of the objectives is to promote and facilitate firewood and charcoal value chain development by a participatory approach bringing stakeholders together to analyze problems and identify solutions at each level of the value chain. All stakeholders, from tree farmers, charcoal producers and traders to consumers, are involved in the development of the value chain. Four specific activities were comprised: value chain development, improved carbonization charcoal-making techniques, development of ICSs and improving brick kilns.

After the project interventions in the past on the structuring of value chain actors, now there are already platforms, associations and cooperatives of charcoal producers, brick makers, cookstove producers and woodlot owners at local, provincial and national level.

Another objective is to create an improved enabling environment for the development of the fuelwood sector. This objective focuses on the creation of public awareness, advocacy and lobbying activities associated with “changing the mindset” at the local, national and regional level. Policies on fuelwood production and use and the role of forestry and agroforestry get their rightful place within the debate. In 2012 the SEW project will work on carbon credit policies in anticipation of possible opportunities for value chain actors in the project.

Cookstove interventions in the SEW project

The focus of SEW in the cookstove sector was to provide technical, financial and institutional support to eleven workshops (seven in DRC, four in Burundi). Through this the quality of the stoves was improved and the production capacity increased.

Several manufacturers could raise prices because they had improved the quality of their stoves; e.g. the ICSs in Butembo that previously sold for EUR 2.30 now sell for EUR 7.70 each. The market demand for ICSs is also increasing, which shows how the population is learning about the stoves’ benefits and is willing to adopt these energy-saving techniques. SEW will continue to work with the manufacturers to see how they can increase the rate of production to meet demand, without sacrificing on quality.

In 2011 three studies on ICS (two in Burundi, one in North Kivu) were done, mapping actors in the sector. The studies revealed that stove producers work at a very basic level, in small quantities and with low quality standards, and that manufacturers are not organized. The studies also revealed that there is good potential to increase ICS production as basic materials (clay and metal) and labor to make ICS’s are largely available. Similar studies will be done in seven additional areas in DRC and two additional areas in Burundi.

3.2 Approach to provide electricity to households

Not relevant for this proposal

3.3 Approach to provide clean cooking technologies to households

The intervention will be based on previous and ongoing activities of the SEW project. The focus is on enhancing stove production capacity and on promoting the marketing system in order to enhance sales levels. The promoted stove is the so-called Butembo stove, a charcoal-burning model used in rural and urban areas. SEW promotes this model because of its efficiency (around 40% of fuel economy) and because it can be made locally. In total, 22 cookstove workshops or enterprises in Burundi and East DRC will be accompanied by EnDev.

Butembo stove

The project will be conducted in five zones in Burundi and East DRC:

- Zone I: Bujumbura-Gitega-Ngozi-Kayanza: this zone, centred around Bujumbura, has a population of approximately 2.8 million inhabitants / 410,000 households.
- Zone II: Butembo-Beni-Bunia: located in North Kivu and Oriental Province, the area around Butembo counts approximately 1.7 million inhabitants / 283,000 households.
- Zone III: Goma-Sake-Minova-Kibumba: around 1.3 million inhabitants / 216,000 households can be found in this area around Goma
- Zone IV: Bukavu-Uvira: located in the South Kivu province, the area counts around one million inhabitants / 166,000 households.
- Zone V: Fizi: located in the South Kivu province, the area counts around 0,4 million inhabitants / 67,000 households.

The population in the intervention area thus amounts to 7.2 million people in 1.15 million households. At an average of two cookstoves per household (which is the usual situation) the total market comprises 2.3 million cookstoves. Estimated immediate demand is 30% of this market or 700,000 cookstoves.

Artisans already trained through the SEW project produce approximately 150 stoves / month.

The present project will contribute to the production and sale of 40,000 cookstoves until the end 2014 by 22 workshops or enterprises in Burundi and DRC; starting from current production levels they are estimated to produce 75 stoves monthly on average during the project period (starting much lower, but eventually reaching 150 stoves / month).

Through 40,000 stoves, 20,000 households will be reached as each household usually uses 2 stoves. As the average household counts 6 members, 120,000 people will be reached through the SEW project.

As 40,000 stoves constitute just 6% of the immediate market and less than 2% of the entire market, the risk of overproduction / saturating the market seems negligible.

<u>Key Intervention 1:</u> Enhance the cookstove production capacity of 22 stove producers in Burundi and DRC by improving quality and quantity of cookstoves

The quality of cookstoves depends on materials used in production (among many other factors, of course). EnDev aims to improve this quality by addressing clay quality, clay processing and the metal sheets used in cookstove production. This also includes the management of sites where clay is extracted.

Focused training sessions on how to produce ceramic parts of good quality will be organized. Use of good quality metal sheets will be promoted.

During the first phase of the SEW project the stove production could already be enhanced and increased four times through loans from microfinance institutions. This activity will be continued with other stove producers in the next phase. Appropriate tools that enable producers of ceramic stove liners to increase their production will be promoted.

The project will promote the linkages between stove makers and microfinance institutions in order to improve access to credit, enabling them to purchase better equipment, which in turn positively impacts quality and, subsequently, the lifespan of stoves. At the same time some essential kits will be provided to the stove makers through the small grant approach with a small own contribution.

<u>Key Intervention 2</u>: Promote marketing of improved cookstoves

Cookstove marketing campaign: consultancy and training- business initiation by young students

Young professionals and students will be contracted for marketing campaigns and dissemination of cookstoves. This will be done under the supervision and coordination of women's organisations. After their training the young professionals will organize demonstration sessions in public locations like schools and market places about the improved cookstoves, the mode of usage, their advantages in terms of fuel economy, ecology and savings.

In practice, in each area or each center, a women's organisation will be contracted to recruit students and coordinate the cookstove marketing and dissemination interventions. Songs, shows, spots on radio and TV, as well as T-Shirts with the promotion message will be used.

Promotion outlets "All-in-One" centres

SEW will promote an "all-in-one energy centres" approach to increase the number of stoves sold. The market remains the best place to sell these stoves to women who come and buy their charcoal and their food. The stakeholders of the charcoal value chain decided that their business could be strengthened by selling their products in the same place where one buys everything related to energy. SEW wants to extend this to other forms of energy in the future.

In the present project, this approach will be used to enhance the sales rate. On average the "All in One centres" were able to sell 200 cookstoves in a month. Around 10 of these centres will thus be necessary to sell 40,000 stoves.

The sellers will be sensitized on this new and modern approach.

Bicycle traders approach

In order to take cookstoves directly to the rural communities which are far from trade centres, additional marketing with bicycles will be done. Five cookstove bicycle sellers will be contracted within each centre.

The bicycle traders will use their own bicycles and get paid per stove sold. The rate will be negotiated with them. The bicycles will get a special box that is padded for safe transport of the stoves as experienced in other projects in Malawi.

3.4 Approach to provide access to modern energy services for social institutions

Not relevant for this proposal

3.5 Approach to provide access to modern energy services to SME's

Not relevant for this proposal

4 Expected impacts of the project intervention

Impact	Possible indicators
Environment	Reduction of deforestation and emissions through use of efficient improved cookstoves: Number of stoves sold to households (stove sales records); number of households using ICS (user survey); hectares of (not) cleared forest
Health	Reduction of emission of carbon monoxide and particle matter, which will reduce respiratory and eye diseases: Number of patients that got respiratory and eye diseases (user survey); Number of registered respiratory and eye diseases in health institutions
Poverty / livelihood	For the users more money available due to lower expenses for fuel, more income for stove producers and retailers: savings on monthly fuel expenditure (user survey); Stove producers, transporters of stoves and retailers perceive a rise in their income and improvements in their livelihoods (survey)
Education	
Governance	

5 Budget

	EUR
1 Human resources and travelling	30,000
2 Equipment and supplies	
3 Funding financing agreements / local subsidies	500,000
4 Other direct costs	31,431
5 Total direct costs	561,431
6 Mark up costs / administrative overheads / imputed profit	38,569
7 Cost price	600,000

Mozambique

Project phase	old: 10 / 09 – 12 / 12			new: 10 / 09 – 12 / 2015		
Project budget	old: EUR 3,800,000			new: EUR 10,800,000		
Target groups	Households, entrepreneurs					
Expected outcome at project end					old target	new target
Number of people	Energy for lighting and electric household appliances				45,600	71,000
	Cooking energy for households				0	250,000
Number of institutions or enterprises	Electricity and / or cooking energy for social infrastructure				26	26
	Energy for productive use / income generation				203	203
Promoted technology	[×] Solar	[ ] Biogas	[×] Stoves	[ ] MHP	[×] Grid	[×] Other
Summary of key interventions and outputs	1. Provide access of poor households to electricity services through (prepaid) grid connections (20,000 people served) 2. Foster marketing of small PV and Hydro technologies; Outputs: Awareness and promotion campaigns and established training programs; up to 5,000 system sales yearly for PV and portfolio for identified hydro sites increased to 120. 3. Support the established institutional structures and processes for testing and quality assurance of PV and improved cooking products / appliances. Outputs: Functional entities on a partly commercial basis. 4. Support the establishment of sustainable structures for PV, small hydro and improved cooking technologies by training and capacitating four societal pillars: private sector, banks, knowledge accumulation / dissemination centres, community development actors; Outputs: established functional network. 5. Support, coordinate and implement priority propositions of the new Biomass Energy Strategy both on technological / market as on institutional development levels. Outputs: 250,000 people served with improved cooking devices. Transparency in the institutional / market value chain improved.					
Coordination with other programmes	GIZ programmes: Economic development, Decentralization, Education and crosscutting HIV / Aids, Disaster management, Gender focal area's. External: World Bank EDAP and associated energy programs (ACCI), UN Global Alliance for Clean Cooking and Lighting Africa, Belgian BTC through FUNAE, Netherlands SNV, British Practical Action, Solidaridad,					
Lead political partner	Ministry of Energy					
Implementing Organisation	GIZ					
Implementing partners	FUNAE, BTC, World Bank, SNV, NGOs, local banks, KfW, AFD, private sector actors					
Project manager	Name: Dirk van Eijk			Mail: dirk.vaneijk@giz.de		

1 Situation analysis

1.1 Energy situation

Mozambique is one of the poorest countries of the world with about 54% of the population living below the national poverty line. Forest resources satisfy more than 85% of total domestic energy requirements and more than 95% of energy supply in rural areas. Mozambique has considerable but under- exploited energy resources, including natural gas (comparable to Norwegian stocks) coal, hydro, oil, solar, biomass and wind.

The energy sector is key to the country's economy already today, since energy exports make up a large share of total foreign exchange earnings. Moreover, the availability of cheap electricity is one of the main reasons for the significant foreign direct investment in energy-intensive industries in Mozambique. Energy exports (hydropower, coal, gas and possibly (bio) oil) and projects to cover the growing domestic electricity demand will play an increasingly important role in the years to come. The liberalisation of the power sector initiated in 1997 allowed for third parties from the private sector to enter the power generation, transmission and distribution markets without impressive results so far (2012).

Access to electricity is among the lowest in the world, especially in rural areas where only 1% of the population is supplied. The national grid including off grid facilities is claimed to reach some 30% of the country today in terms of numbers of people with potential access to the grid (not connected). Many district capitals depend on expensive and often unreliable power generation with diesel generators. Outside these towns, the situation is even worse. The overwhelming majority of rural households, most rural schools, health centres and administrative posts are without access to electricity. Lack of mechanical power is a bottleneck for the rural subsistence agricultural production, as grain producers have to walk long distances to the nearest milling facility. Rural areas lack electricity for lighting, radio and communication in households and for refrigeration in small commerce. Nevertheless, many rural household spend a considerable share of their income for modern energy in the form of kerosene or batteries (EUR 4-5 per month). Lack of access to electricity restricts the local population’s opportunities for income-generating activities.

1.2 Policy framework, laws and regulations

Within PARPA (PRSP), the programme for reduction and alleviation of absolute poverty, the GoM has been granting high priority to efforts to increase access to electricity for the population. Within the PARPA II the GoM has affirmed the critical role of the energy sector in reducing poverty. Adequate and equitable access to energy resources and services such as the provision of energy services to households, rural schools, administrative offices, and hospitals in rural areas is defined as a key driver of growth and poverty alleviation. The energy-related goals set in the PARPA are being operationalised by the Government of Mozambique through a number of strategies, investments and studies that have been prepared or are under way. The PARPA II (§507ff) outlines a programme for the energy sector, which entails: Electrification, Liquid Fuels, Renewable Energy, and Intersectoral Collaboration. The Energy Policy approved March 3rd 1998 by the Council of Ministers under Resolution 5 / 98 established with the following objectives among others relevant for EnDev-Mozambique:

Guarantee reliable supply of energy, at lowest possible cost, in order to meet present

- demand and future levels based on economic development trajectories,
- increase the energy options available for household consumption,
- secure better efficiency in energy utilization,
- promote the development of environmentally friendly conversion technologies, namely
- hydro, solar, wind and biomass,
- promote competitive, dynamic and more efficient entrepreneurs

In March 2009 the Policy for Renewables was defined with the following objectives among others with relevance for EnDev-Mozambique:

- increase the access to modern energy services of high quality and accessible prices,
- reduce poverty and contribute to the millennium development goals,
- contribute to the generation of local and national income and employment

The revised Energy Strategy aims to align Mozambique with best international practices for efficient energy utilization, raising awareness amongst its citizens about good environmental practices, diversifying the energy supply matrix, giving particular emphasis to new and renewable sources of energy and to the opportunities contained within the Clean Development Mechanisms, under the Kyoto Protocol. It should ensure energy availability to sustainably meet the requirements of national socio-economic development by undertaking the necessary actions to increase access to diversified energy sources in a sustainable way, contributing to the welfare of the population and the country‘s socio-economic development. The strategy recognizes accelerating electrification efforts, giving priority to rural areas, through the expansion and intensification of the national grid, the utilization of renewables, the optimization of low cost solutions, and the introduction of measures which will ensure productive and efficient use of electricity (as low consumption / high efficiency light bulbs). The government aims to support regional integration and reflects in its national legal framework the best practices in environmental protection. Mozambique has its own Oil Law and Electricity Law. A regulation defines the licensing of electricity installations; another regulation establishes the competencies and procedures regarding concessioning of production, transmission, distribution and marketing of electricity, as well as its importation and exportation. Other regulations establish the norms for the national grid, the instructions for CNELEC and its regulatory functions, and the Technical Unit for Implementation of Hydroelectric Projects (UTIP). Based on the new Energy Sector Strategy with its specific subsectors of Electrical Energy and New and Renewable Energies, as well as the Energy Strategic Plan 2009 – 2013, the government has prepared a comprehensive 5-year plan for energy development and access. EnDev-Mozambique is fully aligned and consistent with this plan, with PARPA and with the new sector strategy. EnDev-Mozambique will specifically support: (i) grid densification by scaling-up electricity connections in peri-urban areas; (ii) promote market development for renewable energy technologies for household lighting and social infrastructure; and (iii) technology transfer and capacity building for the main implementing partners mainly, but not exclusively of the private sector.

1.3 Institutional set-up in the energy sector

The public sector is represented by:

The Ministry of Energy (MoE) is responsible for national energy planning and policy formulation and for overseeing the operation and development of the energy sector. The MoE is composed of three main thematic areas (Power Sector, Renewables and Liquid Fuels) and a central services management group. The MoE is represented in the provinces through the Provincial Directorates of Mineral Resources and Energy (DIPREME).

Electricidade de Moçambique (EdM), is a vertically-integrated, government-owned electric utility responsible for generation, transmission and distribution of electricity in the national grid. EdM buys most of its power supply (apr. 400 MW) from Hidroelectrica de Cahora Bassa (HCB), owner and operator of the Cahora Bassa hydropower plant on the Zambezi (2,075 MW). The GoM owns 82% of HCB which operates as an Independent Power Producer (IPP) The bulk of the electricity generated at HCB is exported to South Africa, with a small amount to Zimbabwe. EdM sells any excess electricity on the Southern Africa Short Term Energy Market. The Mozambique transmission grid is currently interconnected with South Africa, Zimbabwe and Swaziland.

The Fundo Nacional de Energia (FUNAE) was established in 1997 as a public institution to promote rural electrification and rural access to modern energy services, in a sustainable manner, and as a contributor to economic and social development in the country. Since its

establishment FUNAE has implemented numerous projects using renewable energy technologies to electrify schools, clinics and communities.

The Conselho Nacional de Electricidade (CNELEC) was re-established as an independent advisory regulatory body for the electricity sector in early 2008 with support from the World Bank Energy Reform and Access Project (ERAP). CNELEC was instructed to give its highest priority to an evaluation of EDM‘s performance under its Performance Contract with the GoM. This Performance Contract covers the years 2007 to 2009 and sets out the goals and indicators to be met annually by EDM and GoM. CNELEC was also instructed to conduct a review of the current methodology used by EDM in setting tariffs. In performing the review of EDM‘s performance, the directive instructed CNELEC to conduct its review in an open and transparent manner with public hearings in several locations throughout the country.

The private sector is represented by various licensed private enterprises which participate in the grid extension and household connection works of EdM and private enterprises for the provision and installation of PV products, often situated exclusively in the capital Maputo. A microfinance sector with banks and NGOs is active throughout the country but often exclusively restricted to the province and / or district capitals. The NGO sector is characterized by relatively weak institutional profiles and technical specialisation, as well as weak implementation structures and technical competences.

1.4 Major donor activities

The World Bank is one of the main donors in the energy sector in Mozambique. Since July 2007, it has served as co-chair with the GoM on the —Energy Sector Working Group‖ that was established within the framework of the Paris Declaration. The Bank is in preparation of the second phase of the Energy Reform and Access Project (ERAP), which will now be called Energy Development and Access Programme (EDAP) The proposed project will help establish the necessary operational framework for increasing electricity access to unelectrified areas nationally in a sustainable and programmatic manner, aiming at mainstreaming a sector-wide approach (SWAp) by establishing a comprehensive donor partnership framework for coordinated and sustained financing of investment and capacity strengthening aligned with national priorities and procedures (WB, ADB, ADF, OFID, BADEA, IsDB, Kuweit Fund) With Norway, the World Bank is also co-financing the Mozambique- Malawi Transmission Interconnection Project (cancelled medio 2010) and the Mozambique Regional Transmission Backbone Project. Sweden is engaged together with co-financing of Norway and Denmark in rural electrification (grid extension and household connections) in Sofala, Manica, Tete and Niassa Provinces. Norway is financing rural electrification in Cabo Delgado and grid extension in Gurue - Cuamba – Lichinga and Namacurra – Pebane. Technical assistance (TA) and capacity development for EdM in mega project development for power generation, as well as for the MoE are delivered by Norway and Sweden. Sweden also is embarking on the rehabilitation of the hydropower stations in Mavuzi and Chicamba. The European Commission (EC) is financing rural electrification in Cabo Delgado, Tete and Sofala with EdM, PV electrification in rural areas with FUNAE and capacity building in energy planning and management for the MoE. DFID is giving TA on Biofuels to the National Directorate of Renewable Energy of the MoE.

Belgium has signed a contract with FUNAE in September 2010. The program will focus on off-grid energy systems, based on renewable energy resources (hydraulic, solar and wind), in remote rural areas where no grid connection is foreseen within the next five years. The program will finance, on grant basis, electrification systems for community infrastructures such as administrative buildings, schools, health centres, water pumping devices and public lighting. In addition, renewable energy installations for private use (household, shops or small enterprises) will be stimulated by subsidies (investment funds) and soft loans through microfinance systems.

In order to increase the sustainability of the renewable energy installations, the program will also provide a computerized asset management system and technical assistance focused on

capacity building through training initiatives, research and development. Three long-term international experts (two with technical (PV, Solar) and one with a socio-economical profile) have joined and cooperate with the FUNAE staff during the implementation of the project.

The total budget of the program has been established at EUR 18,000,000, composed of a EUR 15,000,000 contribution of the Belgian Government and an additional contribution of the Mozambican Government estimated at EUR 3,000,000) for payment of all taxes and duties, personnel, staff and office space provided by FUNAE. Also the Netherlands government has joined the Belgian BTC / FUNAE activity in 2011, with an additional amount of some EUR 9,000,000.

Considering the large area of the country and the dispersed population in the rural areas, a geographical concentration and / or clustering of the activities will be essential for the follow-up and the cost-effectiveness of the activities. As the provinces of Manica, Tete, Zambezia and Nyassa have a high potential for small hydropower, the possibility of concentrating activities in these four provinces will be investigated.

EnDev-Mozambique coordinates its activities with the EDAP and Belgian Programs in close cooperation with FUNAE and government structures both central and in the province, as there will be several common intervention areas such as grid densification, PV electrification of social infrastructure and market development of PV systems for households. The EnDev-Mozambique activities are in line with the capacity development needs of the implementing partners of the private sector, NGOs, communities and local entrepreneurs, which will receive business development services and will be trained on the job during the implementation of the activities in the PV and hydropower components.

2 Planned outcome

Energy service segment	Old targets		New targets	
Energy for lighting and electric household appliances	45,600	people	71,000	people
Cooking energy for households	0	people	250,000	people
Electricity and / or cooking energy for social infrastructure	26	institutions	26	institutions
Energy for productive use / income generation	203	enterprises	203	enterprises

3 Project approach

3.1 Energy technologies and services promoted by the EnDev project

The project will support grid densification, the installation of pico and micro hydropower plants, of mechanical power (water mills, ram pumps) and the dissemination of pico and small photovoltaic systems. Combinations with irrigation schemes at the micro hydro sites will continue to be considered and researched.

The project will start to promote improved cooking technologies for households and institutional applications as a new component.

Where feasible and on request options to replace fossil fuels at existing diesel generating plants with biofuels or hydro (solar) power generation will be considered.

All activities will go along with baseline and impact studies in the intervention areas.

3.2 Approach to provide electricity to households

Solar

The project will train existing local solar enterprises and start-ups in solar technologies and business development. Special focus will be on quality aspects of lanterns and marketing strategies. Entrepreneurs will be supported in awareness raising and marketing activities. The provision of seed capital for young entrepreneurs will be considered. It is planned to train 400 technicians and up to 100 companies.

The project will carry out campaigns to familiarize customers with (pico- and small-) solar energy use. A detailed monitoring system for sales of solar systems will be established. It is expected that sales figures of solar systems will reach 5,000 pieces per year.

EnDev-Mozambique will establish a knowledge and (commercial) advisory center in Maputo in cooperation with educational institutes(s) fitted for research, testing, training and (business) advice.

MHP

The current activity which resulted in 12 operational micro hydro installations will continue but in a slightly different way. It is intended to use a combined financing scheme for the investment which shall be provided by FUNAE, commercial banks and local private contractors being trained to do design installation and maintenance work. Typically only the privately owned and operated power plant will be commercially financed with a loan scheme. The minigrid will in most cases be granted and in-house installation partly subsidized or financed with micro loan schemes managed by a community committee or a microfinance institution depending on scale and feasibilities. The same is valid for pico hydro schemes that showed slower progress in the past years. The cooperation with the local NGO, AKSM, will most likely be changed and focused more on community development.

In parallel and increasingly integrated, EnDev has been instrumental in the start up of a knowledge centre in 2012 by the local institutes for higher education: three universities and one polytechnical institute. The Centre of Excellence – Hydro Department (CEHD) will be able to take over substantial parts of the EnDev role and establish training courses related to the (small) hydropower sector.

With an identified (EnDev / FUNAE / DIPREME) portfolio of some 80 sites and a potential of another 500 sites to be rehabilitated or reconstructed there seems a role for that centre both inside Mozambique as well as regional, that could partially be commercially operated for technical (including feasibility / baselines / socio-demographic research) and commercial / financial advice.

Grid densification

Negotiations will be taken up again with the national utility EDM. In the first and second phase of EnDev-Mozambique two contracts have been implemented by EDM where some 22,000 household connections were installed. EnDev paid a 95% subsidy in the first contract for every connection and 75% under the second contract. Efforts will be undertaken to reduce this further to 50% or lower and perhaps on a result based financing basis with an initial upper limit of 4,000 connections, depending on the deal negotiated. The criteria for the selection of households will remain as before: grid was available for at least three years but not connected yet.

3.3 Approach to provide clean cooking technologies to households

Integrated Biomass / Improved Cooking (IBIC)

The approach of EnDev-Mozambique in the field of clean cooking technologies will mainly consist in training stove producers, supporting marketing activities and awareness raising, introduction of new stove types and ensuring high quality of stoves.

EnDev-Mozambique will use the new Biomass Energy Strategy (BEST) as reference and guide to coordinate its activities with those of other organisations. BEST is expected to be available and accepted by the initiating and responsible Ministry of Energy by November 2012.

An inception workshop will be organized soon after this date in order to map out the activities of the entities active in this field and identify their plans and strength and weakness in the succeeding implementation of the BEST recommendations. The budget available for this component will be used for our own activities and agreements / contracts with the identified potential partners such as the Dutch SNV, Practical Action and others that may be able to gear up to the expected levels of quality and output in the given timeframe.

Obviously the existing capacity and built up rural producers networks, by the previous Probec interventions will be incorporated and assisted in increasing the quality of their products and market.

Revitalizing the previous Poca stove production unit may be considered with a different management / financing / marketing / distribution set up and perhaps a modified product.

The market for this or a similar product seems to exist with a city (charcoal) focus. The required production hardware and process knowledge is still and can be made available.

Increased formal EnDev cooperation with the World Bank (WB) and their FUNAE commitments in this sector is foreseen and in principle agreed earlier in 2012. The other Global WB, UN and other donors initiatives have been brought in line with the above approach and accordance with the BEST recommendations. EnDev will take coordination responsibility or may re-enforce the existing biomass working group consisting of the most important stakeholders including the ministries of Energy, Agriculture, Environment, Planning, Finance and other national actors.

3.4 Approach to provide access to modern energy services for social institutions

Whenever possible, social institutions will be connected to the minigrids of hydropower sites. Also PV installations and the installation of improved cookstoves will be considered. Coordination with the FUNAE (BTC) large scale implementation activities in this sector (1,200 sites), will be assured.

3.5 Approach to provide access to modern energy services to SME's

In combination with hydro and where possible solar schemes a systematic analysis will be made on the productive use potential relating to product and technology choice, power supply and financial / commercial viability. In cases this may improve the commercial viability of the power production investment.

4 Expected impacts of the project intervention

Impact	Possible indicators
Environment	Increased use of solar and hydropower generation for lighting, productive use and battery charging (incl. mobile phones). Less (polluting) waste (batteries, woody biomass).
Health	Decrease in occurrence or air pollution related (respiratory) diseases and consequential higher average productivity.
Poverty / livelihood	Higher productivity and productive use of energy may result in higher financial income levels or savings. Access to telecommunication and TV services decreases the sense of isolation and increases the sense of well-being, it enables access to market and price information necessary for strategic planning and sales. Indicators; product diversification, increased turnover.
Education	Curricula for hydro and solar technology developed and in use within existing education programmes. Shorter term custom made trainings developed and running. Increase in evening courses in elementary education.
Governance	Increased decentralized decision making within FUNAE. Increased coordination and management role of the delegated office DIPREME (Ministry of Energy) resulting in documented transparent planning and priority settings. Higher tax revenues from wood / charcoal fuel chain.

5 Budget

	EUR
1 Human resources and travelling	1,900,000
2 Equipment and supplies	450,000
3 Funding financing agreements / local subsidies	3,200,000
4 Other direct costs	698,015
5 Total direct costs	6,248,015
6 Mark up costs / administrative overheads / imputed profit	751,985
7 Cost price	7,000,000

Nepal

Project phase	old: 05.09 – 12.2013			new: 01.2013 – 06.2015		
Project budget	old: EUR 2,640,000			new: EUR 4,740,000		
Target groups	Rural communities and businesses in Nepal					
Expected outcome at project end					old target	new target
Number of people	Energy for lighting and electric household appliances				141,177	240,637
	Cooking energy for households					
Number of institutions or enterprises	Electricity and / or cooking energy for social infrastructure				33	33
	Energy for productive use / income generation				44	289
Promoted technology	[ ] Solar	[ ] Biogas	[ ] Stoves	[×] MHP	[ ] Grid	[ ] Other
Summary of key interventions and outputs	Support the electrification of approximately 100,000 persons and 245 rural businesses (105 new and 140 existing businesses) by facilitating grid extension to rural communities and local entrepreneurs in Nepal • strengthening the umbrella organisation of the grid-based community electrification users to increase, speed up and improve the quality of power supply • support to communities in managing their electricity supply sustainably by trainings and advise on technical, accounting and electrical safety issues • exchange best practices for electrification between successful communities • credit-based financial support to community rural electrification entities (CREES) in order to lower their own contribution • carry out business potential surveys in the target districts for potential enterprises • identify and train enterprise service provider (ESP) as resource persons for business development in the community electrification areas • carry out awareness campaigns and provide information material for productive use promotion in rural communities • support communities in providing incentive packages for rural businesses • development of new and strengthening of existing enterprises					
Coordination with other programmes	Nepal Energy Efficiency Programme (GIZ-NEEP), National Rural and Renewable Energy Programme (NORAD / DANIDA / DFID / KFW), Renewable Energy for Rural Livelihood (WB / UNDP), FMO Development Bank (Netherlands), ELAM (HELVETAS Swiss Intercooperation)					
Lead political partner	Ministry of Energy (MoE)					
Implementing Organisation	GIZ					
Implementing partners	Grid: Grid Extension: Nepal Electricity Authority (NEA) MHP: Alternative Energy Promotion Centre (AEPC)					
Project manager	Name: Mr. Roman Gruener Mail: roman.gruener@giz.de					

1 Situation analysis

1.1 Energy situation

More than 80% of Nepal's population lives in rural areas. Despite this high number only about 35% of the rural population has been electrified by either grid-based or decentralised energy supply. Nepal is ideal for the development of hydropower due to its vast water resources and steep topography. Nevertheless, about 87% of the energy supply in Nepal is provided by biomass including fuelwood (78%), agricultural residues (3.5%) and animal dung (5.5%). Fossil fuels account for 10% which consist of mainly Diesel as well as LPG and coal. Electricity accounts for about 3%. The only significant source in Nepal which is used for electricity generation is large-scale hydropower. The present technically and economically feasible potential (given the state of infrastructure and price of fossil fuel) in the country is estimated to be around 43,000 MW. Until today less than 1.7% of the feasible hydropower capacity has been developed. Only a small part of the population has access to grid electricity in Nepal which is mainly limited to urban areas. In addition, rural electrification in Nepal is very expensive due to the topographical conditions and at the same time the purchasing power of consumers is very low. Nepal's economic and social development is hampered by its inadequate energy supply. In addition, deforestation remains a serious problem in particular in hill and mountain areas. Only 25% of the country remains forested in comparison to 37% in 1990.

The Nepal Electricity Authority (NEA) as the major state utility has a monopoly on producing, selling and distributing electricity. However, it faces an immense increase in electricity demand (approximately 9% p.a.), whereas at the same time production and transmission capacities are limited. Though ambitious development targets are announced by politics, the development of plants and transmission lines cannot keep up with economic development and its induced demand increases. Between 2001 and 2011 peak demand has more than doubled from 391 to 946 MW. Likewise, national annual energy demand has levelled at 4883 GWh with an annual electricity production of 3858 GWh out of which 694 GWh (18.42%) have been imported from India. The resulting gap has to be bridged by frequent load-shedding in particular in urban areas. This has resulted in up to 16 h of load shedding during the dry season (December-March) in major cities in the country. Currently, 652 out of 706 MW installed capacity is hydropower. Around 478 MW (68%) of hydropower capacity is NEA-owned, while 175 MW (25%) is privately owned and operated by independent power producers. Due to rising fuel prices two diesel power plants with a total installed capacity of 53.4 MW were almost abandoned within the last years.

There is not a single institution having full responsibility for rural electrification. AEPC (Alternative Energy Promotion Centre) is promoting rural electrification by stand-alone renewable generation systems (Micro Hydro, Solar Power, etc.) and NEA is responsible for rural electrification through grid extension of the national distribution system. AEPC has the mandate to implement micro hydropower projects up to 500 kW financially and up to 1 MW with technical and advisory services. In rural areas there is a lot of potential to replace traditional fuel consumption and provide households with electricity. There are more than 1,800 micro hydropower potential sites with a total installed capacity of around 27 MW.

In 2008 / 09 consumption of electricity was almost balanced between industrial sector (37.37%) and households (41.4%), while the commercial sector (firms that are not engaged in manufacturing, transport or agriculture) consumed only 7.2%. However, the industrialized and urban areas account for the majority of electricity demand. Disparity in access is stark with the rural population being mainly dependent on fossil and biomass-based fuels.

1.2 Policy framework, laws and regulations

The energy sector is considered as a key sector with regard to future economic growth and the realization of Nepal's development goals, as formulated in the Poverty Reduction Strategy Paper of the Nepalese Government: "Key objectives in the power sector include: expanding electricity coverage in a sustainable and environmental friendly manner by generating

low-cost power; accelerating rural electrification to promote economic growth and improve living standards in the rural areas and to develop hydropower as an important export item".

Energy Policy – 3-Year Interim Plan:

Up to now, the energy policy objectives have been set up as a part of the general 5-Year Plans by the National Planning Commission. Targets for the sustainable use of energy or the efficient use of commercial energy sources have been little discussed. After the national five-year plan ended in 2007, the government opted for three-year interim development plans instead of an eleventh five-year-plan. The energy policy of the latest 3-Year Interim Plan (2010 / 11 – 2012 / 13) has the following objectives:

- Increase public, private, community / cooperative investment in electricity generation and transmission for domestic use.
- Extend electricity transmission line with high priority.
- Increase electricity generation capacity to minimize load shedding.
- Make hydropower projects sustainable and cost effective by making them environmentally friendly and relevant to climate change adaptation measures.
- Develop electricity access as an inseparable part of poverty alleviation.
- Prepare investment friendly environment for construction and development of hydropower projects.

With regard to renewable energies, the strategy is as follows:

- Emphasize the development and expansion of renewable energy under decentralized energy system.
- Give priority on integrated programs for improving the socioeconomic standard of rural people and environmental sustainability through alternative energy.
- Promote partnership and coordination with related stakeholders like local bodies, private sector etc. for the development and expansion of alternative energy.
- Develop the rural energy in consideration with sustainability and appropriateness.
- Give emphasis on research and technology transfer of alternative energy.

The tariffs and prices for electricity and petroleum products, however, are politically determined. They are geared to the lower limit of acquisition costs or not cost-recovering at all. In the past, tariff increase has been denied to the National Electricity Authority (NEA) since 2001. Therefore, NEA's budget is in deficit and has to be balanced by the state. In August 2012 electricity prices have been increased for the first time in 11 years by about 20% which could give NEA a better standing and could also help to develop new potential sites for hydropower plants. Despite this positive development, the prices are still not cost-recovering.

The EnDev project is in line with the sector strategy as envisaged by the Nepalese government. Moreover, it enables the Nepalese government to implement its ambitious rural electrification targets. EnDev supports the Government of Nepal in the implementation of programs regarding grid-connection as well as off-grid solutions.

1.3 Institutional set-up in the energy sector

The Nepalese energy sector is characterized by a strong fragmentation on the government side. Responsibilities are shared between different ministries and the grid-connected sector is fairly separated from the off-grid sector which makes a common and organized planning between the two sectors difficult.

Public Institutions

Several ministries have mandates affecting energy policy issues and the use of energy. Most importantly the Ministry of Energy (MoE) has been created in 2009 after splitting the Ministry of Water Resources and separating the irrigation specific functions from hydropower development. It is mainly working on the grid-connected energy sector. Furthermore, there is the Ministry of Environment (MoEnv) which is responsible for decentralized solutions (i.e. Micro

Hydropower, Solar Home Systems, Biogas, Improved cookstoves) in the sector. The Ministry of Forest and Soil Conservation (MoFSC) plays a role in the biomass sector and the Ministry of Housing (MoH) in the building sector. The Ministry of Commerce and Supplies is responsible for questions regarding the use of fossil fuels.

Nepal Electricity Authority (NEA)

The state-owned utility NEA was founded in 1985 and is affiliated with the Ministry of Energy. Its exclusive field of operation is the generation, transmission and distribution of electricity and the development and operation of the electricity grid. Furthermore, the NEA is co-responsible in the preparation of energy planning and in education and training of professionals in the field of power generation, transmission and distribution. NEA is also responsible for the grid-based rural electrification activities. The NEA cannot decide on electricity tariffs, but depends on the decisions of the "Electricity Tariff Fixation Commission" (EFTC). The revenues from electricity tariffs are not cost covering despite the last tariff adjustment after August 2012. According to its own data, the long-term liabilities of the NEA amounted to 62 billion NRs (about EUR 590 million) at the end of the financial year 2007 / 2008. Due to the daily power cuts, the NEA is publically criticized. It tries to bridge the gap between electricity demand and supply by importing electricity from India. Therefore, a contract for the provision of 150 MW was stipulated. However, due to technical problems during transmission this capacity currently cannot be retrieved. Currently, there are intensively discussed plans to split up NEA and found an independent transmission company while NEA retains generation and distribution. The expectation is that it would promote more Independent Power Producers (IPP) to feed into the grid under favourable conditions, improve the transmission system and allow additional cross-border exchange of power in particular to India.

Alternative Energy Promotion Centre (AEPC)

The Alternative Energy Promotion Centre (AEPC) was founded in 1996 to promote the development and deployment of renewable energies and alternative energy technologies in Nepal. It is a semi-autonomous institution formally attached to the Ministry of Environment. AEPC acts as an intermediary institution between the operational level NGOs / private promoters of renewable energy and the policy decision levels in relevant ministries. Its activities include renewable energy policy formulation, planning and facilitating the implementation of the policies / plans. It is also the main actor for the delivery of subsidies and financial assistance for off-grid Rural Electrification and monitoring, evaluation and quality control during the process of electrification projects. The technologies AEPC is working with comprise Biofuel, Improved Cookingstoves, Mini- / Micro-Hydropower, Improved Water Mill, Solar Energy (Solar Home Systems), Wind Energy and Geothermal Energy.

1.4 Major donor activities

Many donor agencies are active in the area of off-grid rural electrification whereby AEPC is the main actor. It receives basic funding from the Nepalese government but is financed to a large extend by international cooperation projects.

Firstly, there is the new NRREP (National Rural and Renewable Energy Program) which is the successor of the previous Energy Sector Assistance Program (ESAP) and in implementation since July 2012. This program aims at improving the rural energy supply (solar home systems, small hydropower plants, biogas plants and efficient stoves) of Nepal. NRREP manages the Central Rural Energy Fund which will be implemented after an interim period and facilitates the partial financing of investments in rural electrification measures. In the past the ESAP program used to be mainly financed by DANIDA and NORAD. The German KfW Entwicklungsbank participated in the promotion of SHS with a financial contribution to ESAP. Similarly also DFID did provide a financial contribution to ESAP for SHS. The promotion of these technologies is still on-going under the existing mechanism of ESAP but integrated into NRREP in an interim modality to allow a smooth transition to the new program. Due to the short implementation period since July only Norway has signed up to the new program but others are expected to follow soon. The NRREP is supposed to be implemented as a single-

modality approach whereby all donors in the off-grid sector will work under a single framework coordinated by AEPC.

Another important program which works currently close with AEPC is the Rural Energy for Rural Livelihood Program (RERL) by UNDP and World Bank which is supporting the government in implementing the Rural Energy Policy in all districts. In addition, it works on clean energy access through community mobilization models which involves mini and micro hydro, biogas, improved cookstoves and solar home systems.

The Renewable Energy Project (REP), a joint effort by the European Union and the government of Nepal focuses on the provision of solar energy systems in rural areas for social institutions (hospitals, schools, etc.). Furthermore, there are additional smaller projects focusing on improved watermills, biogas and climate change adaption strategies. REP is, however, currently at its closing stage.

The Asian Development Bank has also several large-scale projects in the energy sector for developing the countries' hydropower resources, providing financial assistance for large-scale hydropower development, upgrading the transmission grid (in particular in the west of the country) and improve the distribution system by constructing new substations and switching stations.

Beside its support for the RERL Program the World Bank has financed the construction and rehabilitation or the NEA transmission and distribution system and provided loans for the improvement of transmission capacities between India and Nepal.

The main activities of EnDev partners are mentioned in the following.

There is currently no direct involvement of DGIS in Nepal. In the past, however, there was DGIS participation in Nepal via supra-regional SAARC programmes which focused on environmental protection (including biodiversity and renewable energy) and good governance (mainly supporting decentralization and local governance). There is also a strong and long-term involvement of SNV in Nepal:

One of SNV's major programs (Next Generation Biogas) was developing Nepal's domestic biogas schemes into a viable and vital part of the economy. Up to now, 200,000 families in Nepal have gained access to domestic biogas plants. In order to accommodate the demand for Improved Water Mills, SNV supports the Centre for Rural Technology to upscale its programme to 40 districts (from current 16) which has been integrated into ESAP II in the past and is expected to be continued in the new NRREP. With the program Inclusive Biofuels SNV is exploring possibilities to promote Jatropha sourced biofuel. It will demonstrate the full value chain of Jatropha, from planting, cultivation to processing a final user-product that will include biodiesel.

The focal areas of BMZ in Nepal are Renewable Energies and Energy Efficiency, Sustainable Economic Development and Health and Family Planning. Apart from those and due to the tense situation after the conflict that ended in 2006 and still dominates current politics, there are three GIZ programs working on support of the national peace process. In addition, there is a programme on local governance which used to be a focal area until June 2012 and was switched to Sustainable Economic Development after the government consultation.

Nepal Energy Efficiency Program (NEEP): The programme assists the Nepalese Government in preparing a national energy strategy with a particular focus on energy efficiency and the sustainable use of biomass. Furthermore, it supports the national institutions to introduce energy consumption labels and develop energy efficiency standards for domestic appliances. In collaboration with non-governmental organisations and the private sector the range of uses for energy-efficient stoves is to be increased and their dissemination considerably accelerated. The programme also assists the private sector in establishing an energy efficiency centre.

In the past, KfW has provided financial support for the Middle Marsyangdi Hydropower Project (76 MW) which became operational in 2009. Beside the mentioned support for the ESAP II-based Solar Home System Programme KfW has supported the Domestic Biogas Programme in Phase III which was implemented in close cooperation with SNV.

The Norwegian government has been active as a donor in the Nepalese Energy Sector for many years. Its main focal areas in the energy sector are to use bilateral assistance strategically to leverage hydropower Investments, to support Rural and Renewable Energy Supply as well as Technical Energy Research. Its largest involvement in Nepal supports the off-grid energy supply through the ongoing NRREP programme. Nepal is an energy + country. Although energy + is at an early stage, some elements have been integrated into the NRREP. In the grid-based sector Norwegian government has also recently decided to support NEA in funding of transmission network in cooperation with ADB. Furthermore, it has supported research institutions for establishing laboratories on hydropower research in Nepal.

In the private sector, the 83% Norwegian owned Himal Power Limited (HPL) has successfully operated the 60 MW Khimti hydropower plant for more than ten years. The shareholders of HPL are planning to develop the 67 MW Kirne hydropower project. One of the shareholders, the 100% Norwegian government owned SN Power, is also planning to develop other hydropower projects, such as the 660 MW Tamakoshi III Hydropower project. In addition, Butwal Power Company has received long-term Norwegian support and is active for increasing generation capacities by implementing varies hydropower projects.

2 Planned outcome

Energy service segment	Old targets		New targets	
Energy for lighting and electric household appliances	141,177	people	240,637	people
Cooking energy for households	0	people	0	people
Electricity and / or cooking energy for social infrastructure	33	institutions	33	institutions
Energy for productive use / income generation	44	enterprises	289	enterprises

3 Project approach

3.1 Energy technologies and services promoted by the EnDev project

The objective of EnDev-Nepal is to provide additional 100,000 persons (approximately 18,000 households) with access to electricity by grid extension to rural communities. In addition, the establishment of 150 new rural businesses will be promoted by the project. Furthermore, 200 existing entrepreneurs will receive business development services and access to power to improve their turnover. The clear focus will be on electricity-based businesses but it is intended not to exclude other promising rural businesses. Hence, we assume that at least 70% of promoted businesses will make use of the available electricity which accounts for 105 new and 140 existing businesses provided with power. Both activities will be realised in communities which are supported by EnDev and part off the grid based Community Rural Electrification Programme (CREP) of NEA. The project cooperates for achieving this goal with the Ministry of Energy and the national utility NEA on an implementation level as well as NACEUN the umbrella organisation of all communities benefitting from CREP. For the activities of business promotion the project joint forces and went into an official cooperation with the Swiss INGO HELVETAS Swiss Intercooperation.

3.2 Approach to provide electricity to households

Grid Extension

EnDev will continue to support CREP which was initiated by the Government of Nepal and is implemented by the national utility NEA aiming to connect rural communities to the national grid. Costs for grid extension are predominantly covered by the government through the NEA (90%), whereas the communities have to cover the remaining share by own contributions. Once connected to the grid, the NEA sells bulk power to so-called CREE. Those organisations found and operated by the communities are responsible for the operation and management of the distribution network, collection of revenues from villagers and payment for bulk power purchased from NEA.

Despite this existing programme many communities still struggle to become electrified and operate the CREEs in a sustainable manner. Firstly, communities often lack understanding of each stakeholder's role, responsibilities and rights. Despite a defined electrification process communities are therefore unable to implement electrification timely. Secondly, communication with NEA and monitoring of the contractors' work is in most cases insufficient so electrification progresses slowly and quality of the installations is not assured. Thirdly, CREEs have very limited organisational capacities to operate the local utilities. Besides technical knowledge on maintenance and repair, communities must be able to fulfil the administrative work (e.g. billing and bookkeeping). Fourthly, communities have no access to financial institutions which could provide loans in order to raise parts of the 20% own contribution which it used to be before it was lowered to 10% recently. Therefore, electrification was either still not achievable or delayed for many years. EnDev has supported 49 CREE as part of the CREP of which 28 are electrified currently.

Strengthening NACEUNs capability

As the national umbrella organisation of over 200 CREEs, it is advocating the communities' interests and supporting its members with advisory services and information. It is also a close partner alongside with NEA to promote the model of community electrification in Nepal. EnDev cooperates closely with NACEUN and will strengthen its capacities. NACEUN will be involved in the project's progress monitoring and advised on improving its monitoring system allowing to follow up on its member communities which can be in remote locations and hard to reach. This is also important as NEA does not monitor progress in the communities sufficiently. In addition, NACEUN will be supported in increasing its expertise in particular in tariff setting, management of CREE and income generating activities from electricity in order to pass it on to its members. In addition, they will be supported to advise their members on productive use of electricity which will be outlined in the SME section.

Support to CREEs

Selected communities will be strengthened by offering training activities in order to assure the sustainable operation of the community based utilities. Since the CREEs operate the distribution network independently, technicians are trained on the operation and maintenance of distribution lines as well as electrical safety. House-wiring is predominantly done by local technician, who are trained prior to electrification. Besides the necessary technical aspects, billing and accounting for maintaining the administrative necessities of the community-based utilities are important and CREE members will be trained on finance and accounting. The training should focus on mainly on-the-job training located in CREEs in order to support the participants while performing daily operations. The trainings will be accompanied by an electrical safety awareness program which will include the necessary safety measures on a community level to prevent electricity-related accidents. This will include among others overloading the extension cords, earthing in individual houses, fire hazards and children playing near installations.

Best Practice and exchange between CREE

The various CREE are in different stages of electrification at this moment. Those who are already electrified also have different capabilities of managing the newly established electrifi-

cation. Therefore, the exchange between those CREEs who have established a good management and those who are still struggle with daily tasks will be increased. After identification of "Best Practice" - CREE, regular meeting in the regions and exposure visits whereby CREE members visit and learn from each other will be carried out. In addition, information or poster materials which contain advice (such as electrical safety) in a simple form suitable for the context of CREE staff in rural areas will be prepared. The show cases of best practice CREEs will include administrative and technical issues financial management as well as revenue collection and payment, measures to minimize the technical losses, employment of CREE staff and income generating activities.

Monitoring Committee for speeding up electrification

The monitoring committee established by the project will be strengthened and continue its work to speed up current activities and follow up on progress in additional communities as well as serving as a forum to discuss experiences and tackle the problems that delay electrification processes. It consists of both NEA and NACEUN representatives as well as contractors, CREE members and district representatives on request and is practically supported by a focal person. If urgent action is required the focal person can intervene by approaching contractors, make a personal visit to assist in NEAs regional offices or to support a CREE in contract administration.

Financial Support to CREEs

Since many communities struggle to raise the 20% own contribution, EnDev in cooperation with NEA set up a community rural electricity fund. The fund is administrated by NEA. In the past CREEs applied for a loan, which covered usually between 5 and 10% of the total investment. From the initial financial resources of the fund, NEA has allocated financial assistance to 49 communities. As only 28 are electrified at current date, the project will follow up on its disbursement and advise NEA on implementation. In comparison to the old modality in which the GIZ-supported CREE benefitted, the new subsidy policy of NEA has increased the level to 90%, so the own contribution is lowered to 10%.

Current status of project

EnDev-Nepal started its support of the Community Rural Electrification Programme in 2008. By the end of June 2012 approximately 133,361 persons (24,247 households) were provided with electricity via grid extension in 28 communities that were the main focus of the intervention. In addition, EnDev has supported the electrification of 220 social infrastructure institutions as schools, health posts and local administration buildings. In the field of power for productive use, 357 small businesses were provided with electricity out of which a majority consisted of rice and maize mills, as well as poultry farms and carpentry. In the various training activities which EnDev has conducted over 450 persons have participated in courses on operation and maintenance, accounting and billing as well as productive use of electricity. Hence, they gained valuable skills that contributed substantially to the sustainability of the CREE operation.

3.3 Approach to provide clean cooking technologies to households

In particular in the beginning of electrification, CREEs rely mostly on the income from private households who use energy for domestic purposes. However, as beneficial the usage of power for domestic purposes is, it still does not bring the full benefits of electricity to rural communities since rural businesses for income generating activities are still missing. Firstly, power can be used for either improve existing businesses which can produce more, faster and more efficiently such as rice mills or an electric saw for carpentry. Secondly, new businesses can be created which rely on the availability of power such as telecommunication shops or cooling of drinks and food. Thirdly, in order to make enough profit to manage and maintain the village distribution network more businesses would contribute to the financial viability. It would increase consumption at a higher tariff rate than households and support the CREE in sustaining its operation and hence contribute to sustainability.

Although already 357 rural businesses have been electrified in 28 CREE (e.g. flour mills, carpentry, poultry farms and guest houses) there is still an enormous untapped potential of creating new and support existing businesses.

In order to profit from existing business development knowledge and minimise costs for implementation, EnDev has joined forces with HELVETAS Swiss Intercooperation and formed cooperation in the field of productive use of electricity. In brief, the focus of HELVETAS will be to support the training of business service providers and private entrepreneurs including business potential surveys whereas GIZ-EnDev will support the CREEs in creating a business friendly environment including start-up packages for interested entrepreneurs who would like to use the existing electricity. Although the major focus will be on productive use of electricity the concept does not exclude businesses without power since they still contribute to the wealth creation in the area and have positive impacts. It is planned to establish and electrify 150 new businesses and support and electrify 200 existing businesses in a pilot phase in CREE areas. The activities are planned as follows:

Business survey for potential enterprises

In the beginning, business potential will be identified through Area Potential Survey assessing natural and human resources as well as potential linkages for different potential business opportunities. The surveys are conducted by the so-called Enterprise Service Providers (ESP) themselves as outlined below. In addition to this survey a baseline will be conducted to measure the intended results and provide a base for monitoring.

Enterprise service provider development

ESP are local persons with a business affinity, e.g. small traders, craftsmen, shop keepers After their identification by a selection process they receive training to become resource persons for the private and mainly informal sector in the CREEs area who can pass on their business skills to other interested local entrepreneurs and also earn some income from it. They are trained in a standard business methodology which is adapted to requirements in line with the promotion of productive use of electricity. The training package includes area potential survey orientation, training of trainers on enterprise creation and development by using electricity, book keeping, marketing / selling skill, safety and health, hygiene, business registration and renewal, credit linkage and organisational processes. The broad ESP approach for business promotion shall be complemented where necessary by providing knowledge and training on value chain development. This might be necessary where production of goods (e.g. agriculture, carpentry) is the main business purpose rather than services (e.g. electro repair shops, mini markets).

Involvement of stakeholders

The project activities in the districts will be initiated with a stakeholder information event involving the District Development Committee, the Chamber of Commerce, the Cottage and Small Industries Office (CSIO), the Women Development Office, the NEA Regional Office, the District Energy Units or District Energy and Environment Sections and others which are relevant for the activities. It is envisaged to sign a memorandum of understanding with the District authorities and facilitate endorsement for the project activities for easier implementation.

Development of new and strengthening of existing enterprises

After the training, the ESPs will improve on the one hand their own businesses and on the other look out for potential clients for starting up or expansion of businesses. They will be resource persons which can sell their knowledge of e.g. doing a business plan or company registration. Although this concept of providing business services for payment is not yet the norm in rural Nepal it is starting to grow more and more. In addition to business development services, technical skills development may be included for the ESPs themselves or their clients. This may include trainings based on occupational skills standards of the Council for Technical Education and Vocational Training (particularly for new businesses) or short courses that introduce new, electrical power based technologies without occupational skills

standards. In order to institutionalize the approach a training manual for ESP with the specific focus on the promotion of electricity-based business will be developed.

Productive use promotion in CREE

In collaboration with National Association of Electricity Users in Nepal (NACEUN) and the CREEs, the concept of productive use of electric power will be promoted in the form of trainings and awareness campaigns. NACEUN shall be in a position to advise the CREE on promotion of productive end use. The CREEs in turn shall be in a position to provide advice to their customers on the introduction and possibilities of productive use in their area. For that purpose a training module will be developed.

Incentive packages for rural businesses

CREEs are supported to develop incentive packages to attract potential enterprises to invest in the productive use of electric power. It will include preferential electricity tariffs (short-term or long-term) and soft credits for business start-ups as well as support entrepreneurs in specific product areas with huge potential for the whole CREE. This will also address the issue of access to start-up financing for rural businesses and making linkages with local financial institutions. In particular, the CREEs shall be actively advised and encouraged to extend the use of their existing funding modalities for electrification (existing credit cooperatives / schemes, etc.) to finance equipment for rural business on credit. The CREEs will be supported in developing a business plan to facilitate above discussions.

3.4 Approach to provide access to modern energy services for social institutions

Not relevant for this proposal

3.5 Approach to provide access to modern energy services to SME's

Not relevant for this proposal

4 Expected impacts of the project intervention

Impact	Possible indicators
Environment	Through replacement of diesel mills and kerosene saved because of electric lighting the environment will benefit. Since Nepal's electricity sector is 92% hydropower-based energy, the project also works toward climate change mitigation. An indicator of saved CO_2 can be presented after the inception study.
Health	It will also improve the quality of service from local health posts which can provide treatment at night or use refrigerators for vaccines. Since it is not the main project intervention, it will not be studied in detail.
Poverty / livelihood	The promotion of new businesses and improvement of existing businesses with the availability of power will increase income to the community through stimulation of the local economy and create direct employment. 200 existing local entrepreneurs increase their turnover by at least 30%. 150 new local entrepreneurs start their new businesses. An economic impact study will be implemented to assess the exact results
Education	It will increase studying and reading hours of school children which can use light in the evenings, which will be obtained from the inception study.
Governance	Although governance is not a main focus, the CREE which received electricity gained considerable skills in dealing with government institutions, local authorities and private companies giving them knowledge and confidence in managing their distribution grid which improved their local governance capacity on a community level.

5 Budget

	EUR
1 Human resources and travelling	920,000
2 Equipment and supplies	125,000
3 Funding financing agreements / local subsidies	650,000
4 Other direct costs	157,477
5 Total direct costs	1,852,477
6 Mark up costs / administrative overheads / imputed profit	247,523
7 Cost price	2,100,000

Peru

Project phase	old: 06.2009 – 12.2014			new: 06.2009 – 12.2014		
Project budget	old: EUR 6,400,000			new: EUR 7,900,000		
Target groups	Rural population of Peru					
Expected outcome at project end					old target	new target
Number of people	Energy for lighting and electric household appliances				175,000	175,000
	Cooking energy for households				160,000	260,000
Number of institutions or enterprises	Electricity and / or cooking energy for social infrastructure				4,700	4,700
	Energy for productive use / income generation				2,500	2,500
Promoted technology	[×] Solar	[ ] Biogas	[×] Stoves	[ ] MHP	[×] Grid	[ ] Other
Summary of key interventions and outputs	Improved cookstoves will be further promoted by building on success of prior phases of the project in close cooperation with all stakeholders involved (national and local governments, NGOs, research institutions, private sector). A specific focus will be placed on • promoting good use and maintenance of stoves • strengthening the market (supply chains and after-sales services) • capacity building for cookstove installers • promoting evaluation of cookstoves (technology testing centre, cookstove and spare part certification, gender aspects, stove research)					
Coordination with other programmes	German bilateral programmes in Democracy, Water and Rural Development; IDB & World Bank (energy advisory services to Ministry of Energy); Energy and Environment Alliance (Finland, Andean region); EC and Jica (renewable energy promotion with Ministry of Energy). UNDP for cookstove promotion and carbon financing.					
Lead political partner	Agencia Peruana de cooperación internacional APCI, Presidencia del consejo de Ministros PCM					
Implementing organisation	GIZ					
Implementing partners	Ministries for Social Inclusion, Energy and Mines, Housing, Agriculture, Environment, Health, and Education, Support programmes for the poorest (JUNTOS), Regional Governments, Governments of the Provinces. Private companies especially from the mining sector. Farmer‘s associations.					
Project manager	Name: Ana Isabel Moreno			Mail: ana.moreno@giz.de		

1 Situation analysis

1.1 Energy situation

The concept of universal access to energy has been included as one of nine objectives in the recent declaration of Peru's 2010-2040 National Energy Policy launched at the end of 2010 (SD Nº 026-2010-EM). Likewise included is the objective of developing an energy sector with a minimum environmental impact and low carbon emissions within the framework of sustainable development.

These objectives directly respond to the alarming energy situation in Peru. This is reflected in the 2009 national energy balance sheet: 50% of all the energy consumed by the residential sector is sourced directly from biomass, 23% from liquid or gaseous hydrocarbons, and only 27% from electricity. Besides, according to the 2009 national household survey, 84% of Peruvian households had access to electricity. As it can be expected, there are differences according to areas: while 97% of urban households have electricity, only 56% of rural households have access, meaning that around 600,000 households, or 3 million people, lack electricity. The 2009-2018 National Rural Electrification Plan, prepared by the General Rural Electrification Directorate of the Ministry of Energy and Mines, has fixed a target for the end of that period of reaching at least 80 out of every 100 rural households with access to electricity. For these millions of Peruvians, the only economically feasible possibility in the short and mid-term is local generation of electricity, mainly based upon renewable resources: water, wind, sun, and biomass energy. The Peruvian government has already started concrete actions to acquire island systems which will be operated on a concession base by the companies that currently operate the rural networks.

According to the 2007 population and housing census, 2,036,901 households (30.2%) use firewood to cook, followed by manure used by 282,660 households (4.2%) and charcoal used by 170,643 households (2.5%). In rural areas, firewood is more relevant since it is used by 77.4% of households and manure is used by 14.5% of rural households. Similarly, 95% of schools in rural areas use firewood to prepare the daily food for pupils which also means that these meals are not appropriately prepared. In an attempt to counter this problem, the Presidency of the Council of Ministers allied with public and private organisations (among them GIZ) launched the campaign "Half a Million Improved Cook Stoves for a Peru without smoke" in 2009. This campaign, which has meanwhile been concluded, has allowed to satisfy 20% of the overall demand for improved cookstoves by matching supply and demand in this formerly inexistent market. In addition, progress was made concerning technical norms and regulations for cookstoves.

Except for solar water heaters and chaff, the other non-traditional renewable sources have their scope in rural areas. The solar water heater market – limited until lately only to Arequipa – is expanding to the central highlands and is still a niche market. Only 10% of health care centres have hot water, which limits the possibility of providing quality service to patients and properly manipulating the instruments.

A similar situation is present in small businesses due to the lack of energy services that could add value to their productive processes. At the same time, the scattering of producers prevents access to capital and hence to greater capacity technologies that would allow higher competitiveness and productivity. Post-harvest transformation processes are still traditional in almost all of the productive chains. Coffee production is one of the most important and competitive chains, thanks to the fact that coffee farmers are organized in associations: currently, 30% of coffee producers are members of associations, a new national record.

1.2 Policy framework, laws and regulations

A new government has been elected in 2011 which mainly aims at promoting economic growth with social inclusion, one of the important gaps to be closed. The government's main challenge is eradicating poverty by improving access basic services. Interventions promoted by EnDev-Peru are welcomed and supported by different public institutions, which are project

partners nationwide such as the Ministry for Social Inclusion, Ministry of Housing, Ministry of Health, Ministry of the Environment, Ministry of Energy and Mines and Ministry of Agriculture. The following describes how the legal objectives and frameworks of each of these ministries are allied with EnDev-Peru's objectives.

1.3 Institutional set-up in the energy sector

In Peru, the Ministry of Energy and Mines is the central and ruling body of the energy sector. It aims at promoting comprehensive development of mining and energy activities. It rules, controls and / or supervises, per case, compliance with standards, looking at the rational use of natural resources in harmony with the environment. The Ministry is, therefore, one of EnDev's main partners. However, other ministries such as Health, Environment, Social Inclusion, Housing and Agriculture (on a national level), as well as regional and local governments that aim at improving quality of life and social equity for poor families through access to basic services are also important partners to achieve EnDev-Peru's goals and consolidate the sustainability of its initiatives. There are public and private institutions in Peru which are interested in promoting access to energy because they are aware of the connection between energy, poverty, and economic development. The following are some of these institutions:

Among public institutions promoting access to energy they are: Social Inclusion, Energy and Mines, Housing, Agriculture, Environment, Health and Education Ministries, and Regional and Local Governments. The Social Inclusion Ministry aims at overcoming poverty and promoting social inclusion and equity. It also aims at protecting vulnerable and abandoned people at risk through social programs such as the Juntos Program, which supports the poorest population and Foncodes and Pronaa, which aim at improving nutrition, health, education, and identity services for the most vulnerable sectors of the country. The Ministry of Energy and Mines promotes universal access to energy, particularly rural electrification in its 2010-2040 National Energy Policy, as well as energy development with minimum environmental impact, especially in isolated populations. In this context, pico photovoltaic systems promoted by EnDev are a pre-electrification solution the ministry is interested in. Likewise, the Housing Ministry aims mainly at promoting bioclimatic and energy-efficient houses for high Andean zones. The Agriculture Ministry promotes several projects to improve small farmers' competitiveness. EnDev has a strategic alliance with Agroideas, which aims at improving competitiveness of small and micro size producers by encouraging association and adopting energy services already implemented in the country and thus ensure their sustainability. Similarly, regional and local governments develop several programs to provide their population with access to energy.

There are currently several NGOs, companies and schooling institutions in the private sector that promote access to different energy services and EnDev-Peru works in synergy with them. ITDG-Peru Soluciones Prácticas is among the most important since they have implemented several generation projects for isolated areas through photovoltaic systems and micro hydropower units. Together with EnDev, the energy regional office is developing a management model for isolated systems in the province of San Martin. In addition, an instrument to perform energy needs comprehensive assessments is being adapted to improve access to energy in families of the rural areas of the country. In the case of photovoltaic systems, there are several companies focused on selling them. Peru Microenergias is a basic electricity service provider (lighting and communication) that operates solar home systems in isolated rural communities ensuring sustainability through the monthly fee they collect from users. Companies such as Genera and Q-Energy are devoted to providing non-conventional energy solutions using technologies such as pico photovoltaic systems.

Regarding improved cookstoves, several institutions have created a promotion platform having its origins in the National Improved Cook Stove Campaign. The platform is made up by research institutions such as: Grupo de Apoyo al Sector Rural de la Pontificia Universidad Católica del Perú (The Catholic University of Peru's Rural Sector Support Group), Instituto de Altura de la Universidad Cayetano Heredia (the Altitude Institute of Universidad Cayetano Heredia). There are also NGOs such as: Instituto Trabajo y Familia a través del Programa

Sembrando (Work and Family Institute through its Sembrando program), ADRA, PRISMA, CARE, CARITAS. Another important player in this platform is MICROSOL**,** a social company that works in alliance with the Swiss foundation myclimate. They have developed the "Qori Q'oncha" (Golden Hearth) Program which is one of the first voluntary carbon programs in the world in issuing carbon bonds for improved cookstoves. Microsol supports every institution that has built more than 500 improved cookstoves by providing them with technical advisory services so that their cookstoves generate value in the carbon market. In September 2010, the Peruvian program issued its first carbon bonds which were received by Sembrando and Properu. Both NGOs will use the generated bonds to ensure the sustainability of the installed improved cookstoves.

1.4 Major donor activities

Activities of Germany and The Netherlands

Peru is a partner country of German development cooperation (GIZ). GIZ has been working in Peru on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) since 1975, and on behalf of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) since 2009. As one of the major bilateral donors, Germany is contributing to sustainable development and poverty reduction in Peru. In recent years, cooperation with other international donors has increased. The Government of the Netherlands, the Swiss Government, and the European Commission are co-financing some projects.

Peru has just experienced a decade of exemplary economic growth in which it has succeeded in doubling its per capita GDP. The number of people living in poverty has fallen from 54% in 2001 to 35% in 2009, with the share of people living in absolute poverty more than halved from 24% in 2001 to 11.5% in 2009. Notwithstanding these achievements, the country still has large income gaps and a high concentration of poverty in rural areas. Structural problems, such as the still strongly centralized state, are obstacles to more efficient and more transparent governance and to the provision of basic services to the population.

Moreover, Peru is one of the countries which are most affected by climate change. More than 50% of the population lives in the narrow desert belt along the Pacific coast, where shortfalls in water supplies are a growing problem. Peru has the fourth largest area of tropical forest in the world after Brazil, the Democratic Republic of the Congo, and Indonesia. These vast forest reserves are being steadily destroyed as a result of overexploitation and the extraction of natural resources. This is also threatening Peru's biodiversity, which is regarded as one of the richest in the world.

In accordance with the agreement between the German government and the government of Peru, GIZ's work focuses on three priority areas:

- Democracy
- Water
- Rural development

Activities of other donors

IDB and the *World Bank* are advisors to the Ministry of Energy and Mines concerning regulation, promotion and implementation of the National Rural Electrification Plan, as well as on the productive uses of energy. The *Finnish Cooperation* finances the *ENERGY AND ENVIRONMENT ALLIANCE PROGRAM* with the Andean Region, which is executed by the *Inter-American Institute for Cooperation on Agriculture (IICA).* This alliance encompasses renewable energy, bioenergy and energy efficiency aspects. The *European Union* and the *Japanese Cooperation* support the Energy and Mines Ministry in implementing renewable energy projects.

2 Planned outcome

Energy service segment	Old targets		New targets	
Energy for lighting and electric household appliances	175,000	people	175,000	people
Cooking energy for households	160,000	people	260,000	people
Electricity and / or cooking energy for social infrastructure	4,700	institutions	4,700	institutions
Energy for productive use / income generation	2,500	enterprises	2,500	enterprises

3 Project approach

3.1 Energy technologies and services promoted by the EnDev project

This upscaling proposal is exclusively aimed at promotion of improved cookstoves, increasing the number of beneficiaries by 20,000 families and further consolidating and the project approach. This objective shall be achieved in close cooperation with both public and private players at national, regional and local levels.

3.2 Approach to provide electricity to households

Not relevant for this proposal

3.3 Approach to provide clean cooking technologies to households

This upscaling proposal will allow intervening in more departments and broadening the number of activities. The number of beneficiaries has been increased to 200,000 people with improved cookstoves. The original five intervention departments were La Libertad, Cajamarca, San Martín, Moquegua and Tacna. During the last upscaling, four were added – Apurímac, Huancavelica, Cusco and Ayacucho. The strengthening of improved cookstoves supply will be pursued in every department, adapting technological designs (when required) and strengthening distribution, sale and post-sale promotion strategies. This will allow stove producers to expand the market with new clients, such as state institutions that are interested in acquiring improved cookstoves for the poor population, private companies interested in stoves for productive uses or households interested in stove purchase or who would like to buy spare parts for maintenance.

Use, maintenance, repair and replacement of stoves will be reinforced. A Good Use and Maintenance Campaign (Campaña BUM – Buen uso y mantenimiento) will be deployed regionally and locally to achieve this objective.

At this consolidation stage, the Cooking Energy Line comprises five components, emphasizing the development of a stove market based upon capacity building and gender mainstreaming.

Development of strategies for the good use, maintenance, spare-part and / or improved cookstove replacement and their sustainability.

There is a direct relationship between information / education on the use and maintenance of stoves, their good functioning and their useful life. Strategies reinforcing these aspects will be deployed according to characteristics and players present in departments where improved cookstoves have been installed.

<u>BUM Campaign (Good Use and Maintenance) for improved cookstoves</u>

The BUM Campaign will strengthen the change of practices among families by raising awareness, informing and educating them about the benefits of improved cookstoves in connection with health and the environment and the need for good use and maintenance to en-

sure these benefits in the long run. The BUM campaign will design a package of measures and tools according to the intervention level, either regional or local. The activities to be developed are described in the following:

Dissemination plan in the mass media: Clear messages on good use and maintenance will be disseminated in nine regions in the country. There will also be information on where improved cookstoves can be repaired or new ones bought. This activity will comprise: 1) content and material design; 2) content adaptation according to local context; 3) dissemination plan preparation; 4) information dissemination.

Messages will be adapted to the media (mainly to radio broadcasters) and, to a lesser extent, to local TV. According to regions and localities, messages will be in Spanish, Aymara and / or Quechua. Radio and TV broadcasting will be supplemented with printed publicity (posters, brochures, stickers and others), as well as fixed murals in some places in the community or portable billboards to be shown at communal fairs. In addition, EnDev will use non-conventional media preferred by the population (for example, mobile messaging).

Establishment of alliances for dissemination: For a better outreach and effectiveness of the BUM Campaign's dissemination plan in the mass media, key institutions and key players will be identified to: 1) determine the scope and contribution for the BUM massive dissemination plan; 2) integrate BUM at local and regional government media agencies; 3) develop local actions to complement the BUM Campaign (contests of successful local experiences).

Support networks: Support networks will be promoted according to characteristics of departments where the EnDev project has provided technical advisory in installing improved cookstoves. The objective is to dynamize commitment so that regional or local players appropriate the BUM Campaign and make it feasible. The following have been foreseen: 1) knowledge transfer and capacity building; 2) verification of the state of repair of improved cookstoves priorly installed; 3) integration of BUM in ministries and regional or local programs or projects; 4) BUM dissemination in local mass media.

The clean energy subject will be promoted in primary schools in coordination with the Ministry of Education at regional and local level by means of diversifying their curricula with training for teachers so they can help build capacities on this issue. Within the framework of two programmes of the Ministry of Health, a change of practices will be reinforced among families. Endev will develop the necessary tools for this task and it will coordinate and corroborate them with other entities, either public or private.

Evaluation: A baseline concerning the information level among families on improved cookstove BUM will be established before exposure to the massive information campaign. At the end of the campaign, a new measurement will be made to contrast obtained results and establish the impact attained.

Strengthening commercial stove structures

Strengthening improved cookstove markets for families, institutions and productive uses

This component aims at strengthening the coordination of existing supply and demand. Supply comes for improved cookstove producers, whereas real and potential demand come from customers such as regional and local governments, private companies and the population at large who might be interested in purchasing an improved cookstove for institutional, productive or family use. Entrepreneurs in different departments who have implemented sales and after-sales services of improved cookstoves with sound business plans will be strengthened. Aiming at diversifying and broadening the improved cookstove market, new activities will be performed, such as validating three locally-developed portable stove models that are easy to transport and install. Improved cookstove market feasibility studies, business plans and strategic alliances with companies interested in investing resources for a massive production of portable stoves have been undertaken. Formal and informal goods and services distribution channels identified in Component 1 will be used to promote the sale of improved cookstoves,

strengthening the sales force to thus ensure accessibility of technology in the remotest communities.

Access to LPG stoves

The Peruvian Government has approved the Energetic Security System and the Fund for Energetic Social Inclusion (Fondo de Inclusión Social Energético – FISE). Their objective is that poor families receive access to natural gas (LPG) through a subsidy for gas bottle and for gas stoves. There is the possibility that EnDev and the Ministry of Energy and Mines or local governments will promote the use of natural gas and the its adoption through communication strategies, thus contributing to its sustainable use.

Capacity building

Improved cookstove installer training

The EnDev project and the National Training Service for the Construction Industry – SENCICO have jointly developed a short course on improved cookstoves. EnDev will promote the training of local installers that were formally trained by public and private institutions during the National Improved Cookstoves Campaign. Technical knowledge that complies with construction standards proposed by the Ministry of Housing will be part of the training. Besides, SENCICO will be officially acknowledged as the institution in charge of training qualified installers in the country.

Implementation of a diploma on access to energy services emphasizing energy for cooking

The course on Design of Cooking Energy Projects will be extended to a diploma on sustainable access to energy services and poverty reduction. EnDev will coordinate with academic institutions such as Universidad Nacional de Ingeniería and NGOs such as Soluciones Prácticas which will contribute to the course. This will help to build energy access capacities of staff in public and private institutions at regional level.

Strengthening institutionalization of improved cooking certification

Evaluation and certification of improved cookstoves was institutionalized at the National Service of Training for Construction and Industry – SENCICO, which receives on-going technical assistance by EnDev. At this stage, SENCICO will be strengthened by: 1) supplying new equipment to measure pollution within houses in the field; 2) training of the technical team in charge of evaluations on the new international standards (ISO–IWA 2012) and management of statistical tools and sample designs.

Following evaluation of 22 improved cookstove models in the laboratory together with SENCICO, technical assistance will focus in consolidating field evaluation and the supply of this service will be promoted. Public institutions (at the local and regional level such as social programs), and private entities such as NGOs will be active part of this stage. New technical evaluation teams will be trained in managing procedures, use of equipment, and analysis and interpretation of data from different improved cookstove evaluation tests. By applying the knowledge accumulated over past project periods, EnDev will promote the design of improved cookstoves with supplementary uses, such as, for example, heating, to respond to the cold season in high Andean areas.

Knowledge management

EnDev will support the preparation of an indicator-based evaluation system on improved cookstoves and their impact within the framework of the Qali Warma Program (by the Ministry of Development and Social Inclusion). The standardization of an indicator system will allow analyzing the impact of improved cookstoves installed through this program, aimed at installation of institutional stoves for rural schools.

3.4 Approach to provide access to modern energy services for social institutions

Not relevant for this proposal

3.5 Approach to provide access to modern energy services to SME's

Not relevant for this proposal

4 Expected impacts of the project intervention

Impact	Possible indicators
Environment	less firewood consumed and therefore reduced deforestation; reduced CO_2 emissions
Health	reduced indoor air pollution, better hygiene through hot water
Poverty / livelihood	better living and working conditions in the household; money and time saved due to reduced fuel consumption
Education	The people in the project area will become aware about the ICS and their benefits and the negative aspects of indoor air pollution and traditional stoves.
Governance	An institutional arrangement is in place that allows better harmonization of ICS interventions and steering of the sector.

5 Budget

	EUR
1 Human resources and travelling	765,000
2 Equipment and supplies	45,000
3 Funding financing agreements / local subsidies	430,000
4 Other direct costs	64,852
5 Total direct costs	1,304,852
6 Mark up costs / administrative overheads / imputed profit	195,148
7 Cost price	1,500,000

Senegal

Project phase	old: 04.2009 – 12.2014			new: 04.2009 – 12.2014		
Project budget	old: EUR 7,200,000			new: EUR 8,500,000		
Target groups	Rural and (peri-)urban households, social institutions and small enterprises					
Expected outcome at project end					old target	new target
Number of people	Energy for lighting and electric household appliances				59,700	59,700
	Cooking energy for households				400,000	500,000
Number of institutions or enterprises	Electricity and / or cooking energy for social infrastructure				549	549
	Energy for productive use / income generation				145	145
Promoted technology	[×] Solar	[ ] Biogas	[×] Stoves	[ ] MHP	[ ] Grid	[ ] Other
Summary of key interventions and outputs	FASEN: Establishment of commercial supply-demand systems for ICS. Up-scaling is only requested for FASEN (stoves) for the following key interventions: 1) Scaling-up production and promotion of ICS in rural areas 2) Fostering local production in peri-urban areas 3) Increased mechanization of ICS production in urban areas 4) Fostering quality assurance of ICS 5) Development and piloting of cleaner cookstoves					
Coordination with other programmes	Promotion of Renewable Energies, Rural Electrification and Sustainable Supply of Household fuels (PERACOD)					
Lead political partner	Ministère de l'Energie et de Mines (MEM)					
Implementing Organisation	GIZ					
Implementing partners	Direction de l'Energie (DE), Agence Sénégalaise de l'Electrification Rurale (ASER)					
Project manager	Name: Mansour Dahouenon			Mail: mansour.dahouenon@giz.de		

1 Situation analysis

1.1 Energy situation

The majority of the twelve million Senegalese uses wood, charcoal or agricultural residues as their main and often only source of fuel. Wood and charcoal satisfy 90% of the energy needs of Senegalese households. 45% of the total energy consumption in Senegal is wood energy (SIE-Senegal 2010). This intense usage of biomass energy, coupled with a dominance of traditional technologies with low energy efficiency, results in a loss of 40,000 ha of forest annually (FAO 2010). A continuation of this trend will result in a scarcity of the available of wood fuel, which will increase the monetary of physical cost of accessing the fuel for domestic cooking and contribute to desertification.

1.2 Policy framework, laws and regulations

To address the biomass energy situation, the Government of Senegal has adopted policies and strategies to promote the development of alternative household fuels and the introduction of energy efficient modern stoves. Various policy papers on the energy sector have been published. The targets for the biomass energy sub-sector have been formulated to assist achieving the overarching objectives of the Economic and Social Policy Document (DPS).

The overall objective of the biomass sub-sector energy policy is "to ensure sustainable supply of cooking energy to urban and rural households while preserving forest resources and the environment."

The country has the following policies on domestic fuels:

- Energy Sector Policy and Development Paper (LPDSE)
- Domestic Fuels Sub Sector Policy and Development Paper (LPDSSE) (2008)
- Domestic Energy Strategy (SED)
- Domestic Energy National Plan (PNED) (2009)

1.3 Institutional set-up in the energy sector

Until early 2012, there was a department under the Ministry of Energy responsible for the domestic energy. However, after the election in March 2012, the new structure of the Ministry of Energy and Mines has not yet been elaborated. Hence there is so far no specific unit identified which is in charge of biomass energy or domestic energy matters.

The Ministry of Environment is in charge of the supply side matters of wood energy. The division for the management and forest production supports the exploitation and sustainable wood energy production in the country.

PERACOD has supported the coordination between the two ministries. However, this has turned out to be rather difficult and not very effective as of now.

1.4 Major donor activities

The World Bank is engaged in the promotion of improved cookstoves through its program PROGEDE. The target is to disseminate 400,000 stoves. This program started in 2010. However, until now, not many activities have been implemented on the ground.

FASEN is cooperating with a number of natural resource programs which do have a component of ICS (PROGERT, PGIAAPAO, PGIES). These programs are of limited geographical outreach.

There are also carbon funding projects with E&Co and Sen Funds / Eco Village.

2 Planned outcome

Energy service segment	Old targets	New targets
Energy for lighting and electric household appliances	59,700 people	59,700 people

Cooking energy for households	400,000	people	500,000	people
Electricity and / or cooking energy for social infrastructure	549	institutions	549	institutions
Energy for productive use / income generation	145	enterprises	145	enterprises

3 Project approach

3.1 Energy technologies and services promoted by the EnDev project

FASEN will up-scale the sales of the already proven stove technologies.

"Sakkanal" metal wood and charcoal stove	"Sakkanal", metal wood and charcoal stove	"Djambar" metal-ceramic charcoal stove	"Djambar" metal-ceramic wood stove	"Lego" banco wood stove
				
30% charcoal and 40% wood	30% charcoal and 40% wood	30% charcoal	40 and 45% wood savings	40% wood savings
Price:EUR 7	Price:EUR 7	Price:EUR 6–15	Price:EUR 8–2	Price: EUR 2
Amortized in two months	Amortized in two months	Amortized in two to three months	Amortized in three to four months	Amortized in one week

Additionally, FASEN will develop and pilot the production and use of cleaner cookstoves:

- The éclair charcoal stove, which was developed by EnDev in Benin, shows significant reductions of CO emission as compared to the traditional charcoal stove (Cloporte). This technology will be adjusted to the cooking pots in Senegal and tested for its suitability.
- Biomass gasifier cookstoves will be tested in cooperation with a private company. The fuel used in these stoves will be pellets produced by the private company from Typha which is harvested as a weed from the irrigation system of the paddy farmers.

3.2 Approach to provide electricity to households

Not relevant for this proposal

3.3 Approach to provide clean cooking technologies to households

In the ongoing phase of EnDev, FASEN has reached more than 220,000 people with a cost-efficiency of approximately EUR 3.5 per person. The additional funding will support a further expansion of this component of EnDev Senegal.

Scaling-up production and promotion of ICS in rural areas

In EnDev 1, FASEN focussed on working in the urban centres of Dakar and Kaolack. The second phase has been dedicated to expand the impact area from the urban centres to rural areas. This change required the identification of other technologies, other implementation

partners and dissemination approaches. The training of artisans has progressed and will be intensified in the two years to come. The new producers will be integrated into an enlarged distribution network. Awareness and massive marketing campaigns will further stimulate the demand for the stoves produced in the new rural impact areas.

Fostering local production in peri-urban areas

Within the new impact areas, small rural towns with a peri-urban population demand the supply of charcoal stoves. Private traders sourced ICS from Dakar or Kaolack to supply the Jambar and Sakhanal stoves to their peri-urban customers. The long transportation increased the retail price of the stoves significantly. FASEN has started to decentralize the stove production from the urban centres into the small towns. This process will be further strengthened in order to establish localised supply-demand systems. The demand for the ICS will be increased by additional massive awareness and marketing campaigns.

Increased mechanization of ICS production in urban areas

Many artisans have been trained in Dakar and Kaolack to produce the Jambar and Sakhanal stoves. However, there are indications that the supply cannot reach the demand. EnDev started to offer well performing craftsmen support for the investment into improved tooling on a cost-sharing arrangement. This process has progressed well in Dakar (20 artisans), while in Kaolack only three artisans have been reached so far.

With this upscaling proposal, FASEN wants to reach many more artisans in Kaolack with improved mechanization until 2014. At the same time, the role of the program shall be gradually taken over by a microfinance institution.

In Dakar, FASEN will be going one step further by assisting two producers in the installation of a highly mechanised, semi-industrial production system which will allow a considerable increase of their output.

Fostering quality assurance of ICS

The Centre for Study and Research on Renewable Energy (CERER) of the University of Dakar has recently been accepted by the Global Alliance for Clean Cookstoves as one of the regional testing centres. It will receive financial and technical support for the emission testing of cookstoves.

FASEN has been collaborating with CERER for many years and is planning to assist CERER to increase its testing capacities. The ICS promoted by FASEN will be tested for fuel use, emissions, indoor air pollution and safety according to the IWA methodology as soon as these facilities are established at CERER. This shall be coupled with in field testing to allow a better understanding of lab performance and field performance of selected stoves.

Development and piloting of cleaner cookstoves

The éclair charcoal stove has been developed by EnDev in Benin. It has shown a 40-60% reduction of CO as compared to the baseline stove. While the CO levels are rather high as compared to the IWA standards, it is still a significant reduction as compared to the existing stove technology. This stove will be adjusted to the cooking pots of Senegal. If field testing is showing satisfactory results, the stove will be scaled-up in the urban and peri-urban impact areas of FASEN.

Gasifier cookstoves have been found to be the cleanest biomass cookstoves available at this point in time. However, GIZ in general and EnDev in particular have no experiences in the application of this type of stove in developing countries. An agricultural company in Senegal has started to produce pellets from Typha as a fuel for their contract farmers. FASEN has negotiated to support the second phase of this field test which includes an increase of the fuel production, a review of the stove technology and a scaling-up of the number of households reached in the test. Technical support will be given through CERER and external consultants to better assess the chances and challenges of this approach both in respect of the fuel production as well as on the cooking technology.

3.4 Approach to provide access to modern energy services for social institutions

Not relevant for this proposal

3.5 Approach to provide access to modern energy services to SME's

Not relevant for this proposal

4 Expected impacts of the project intervention

Impact	Possible indicators
Environment	reduction of CO_2 emissions and preservation of woodlands (by an established calculation method)
Health	reduced number and severity of respiratory diseases
Poverty / livelihood	reduction of energy costs or time saved for users (impact study)
Education	
Governance	The Ministry of Energy has the necessary tools to monitor the supply chain of improved cookstoves.

5 Budget

	EUR
1 Human resources and travelling	565,000
2 Equipment and supplies	96,700
3 Funding financing agreements / local subsidies	90,000
4 Other direct costs	363,923
5 Total direct costs	1,115,623
6 Mark up costs / administrative overheads / imputed profit	184,377
7 Cost price	1,300,000

Uganda

Project phase	old: 04.2009 – 12.2012			new: 04.2009 – 12.2014		
Project budget	old: EUR 4,000,000			new: 6,000,000		
Target groups	main target group: households; additional target groups: social institutions, SMEs					
Expected outcome at project end					old target	new target[13]
Number of people	Energy for lighting and electric household appliances				29,000	12,500
	Cooking energy for households				1,100,000	600,000
Number of institutions or enterprises	Electricity and / or cooking energy for social infrastructure				194	200
	Energy for productive use / income generation				240	100
Promoted technology	[×] Solar	[ ] Biogas	[×] Stoves	[ ] MHP	[×] Grid	[ ] Other
Summary of key interventions and outputs	The programmes focuses on two main intervention areas: (1) Energy for lighting and electric household appliances (grid connection and solar PV), (2) Cooking Energy for households.					
Coordination with other programmes	PREEEP closely coordinates with its sister GIZ programmes at the Office of the Prime Minister (OPM) and Financial Sector Development (FSD) as well as the Energy for Rural Transformation (ERT) II Programme financed by World Bank – especially with regards to the Photovoltaic Targeted Market Approach (PVTMA)					
Lead political partner	Ministry of Energy and Mineral Development (MEMD)					
Implementing Organisation	GIZ					
Implementing partners	Rural Electrification Agency (REA), private sector, NGOs					
Project manager	Name: Markus Exenberger			Mail: markus.exenberger@giz.de		

[13] The EnDev programme in Uganda faced various problems leading to severe underperformance; in retrospect it is acknowledged that previous targets often were overambitious (assuming a cost efficiency of 2 EUR / person for stoves) while sustainability of results was insufficiently guaranteed; achievements in the electrification domain have been far too costly, while data in the domain of cooking energy were not sufficiently reliable.
Over the last year many changes were made, including personnel, and all components of the programme were reviewed and redesigned. The current proposal relates to the redesigned strategies only. The above mentioned new targets are the sum of results achieved so far plus additional results projected to be achieved through the new approaches in the coming two years
The electrification activities thereby should be considered pilots for the new approach; only small numbers of beneficiaries are foreseen, that however, like the ICS beneficiaries, were required and do meet the respective cost-efficiency targets (EUR 5 per capita for cooking energy in households and EUR 50 per capita for electrification in households:
EUR 1,295,000 of the up-scaling budget relates to 400,000 people newly served with ICS, resulting in a EUR 3,2 per capita investment;

- EUR 188,000 of the up-scaling budget relates to 3750 people newly grid connected @ EUR 50 per head;
- EUR 175,000 is budgeted to provide 5000 more people in households with solar PV (EUR 35 per person);
- The remaining EUR 340,000 is proposed to be used to provide 70 SI with solar PV.

1 Situation analysis

1.1 Energy situation

Development of the energy sector is key to economic growth in Uganda. The country has a total energy consumption of approximately 11 million toe (tonnes of oil equivalent) (2010). This demand is met by various resources including solar and biomass energy, hydropower and fossil fuels. Biomass energy is used by 97% of the population, in form of firewood, charcoal or crop residues to satisfy the need for cooking and water heating in rural and urban areas and accounts for 91.5% of the total primary energy consumption. Due to this heavy dependence on biomass energy, 30% of rural regions in Uganda register a rapid depletion and overuse of forests. Currently only 7% of Uganda's land area is covered with forest. Most severely affected is the tropical high forest which has been reduced from about 19% coverage of Uganda to a mere 3%. Deforestation continues at a rate of 2.2% per year of the remaining forest coverage, leading to fuelwood scarcity in rural areas and an increase in price levels of charcoal and fuelwood in urban areas (about 6% per year). The speed of deforestation partly is due to the use of inefficient three-stone fires.

According to available data, Uganda´s electrification rate is 12% at national level and 5-6% in rural areas. Especially rural households strongly rely on traditional lighting technologies (e.g. candles or kerosene lamps) that give poor quality lighting, emit noxious fumes and present a hazard in terms of fires or burns (especially for children). The majority of social institutions in rural areas do not have access to electricity, significantly lowering the ability to deliver good quality services. Lack of access to electricity also is a key factor obstructing local economic development; lack of electricity hampers establishment of businesses and job creation that require electricity and forces companies to buy diesel or petrol generators that are costly to operate. In addition, lack of electricity limits access to information and communication technologies, which contributes to continued isolation of rural areas.

1.2 Policy framework, laws and regulations

The government of Uganda has over the past eight years embarked on a Power sub-Sector Reform Programme which has seen the implementation of significant structural changes within the sector. The Reform Programme is aimed at providing adequate, reliable and least-cost power supply to meet the country's demand, promoting the efficient operation of the power sector and scaling up rural and peri-urban access to energy. These reforms have established a solid framework, while the country continues to experience significant challenges in increasing access to modern energy services. A low level of access to modern forms of energy, particularly electricity, has continued to be one of the major infrastructure bottlenecks to socio-economic growth in Uganda. Of special importance for the sector is the Electricity Act (1999) and the Renewable Energy Policy (REP) for Uganda (2007)

Energy is also an integral part of the Ugandan government's Poverty Eradication Action Plan (PEAP) which includes frequent references to the link between energy and poverty alleviation. The Ugandan government has set the target of providing 10% of rural population with access to electricity until 2012. It was planned to be achieved by grid extension (including through private sector involvement), minigrids and stand-alone electrification systems. The national electrification rate has been increased to about 12% - but in rural areas only 5 to 6% are electrified. Hence, further interventions are needed to achieve the targets and increase access to electricity.

Though the Renewable Energy Policy shows some emphasis on the biomass sector in Uganda, it is less understood and heavily underfinanced. Currently the Ministry of Energy and Minerals Development (MEMD) has embarked on the development of a Biomass Energy Strategy in cooperation with UNDP, GIZ and other partners.

1.3 Institutional set-up in the energy sector

There are three main government institutions dealing with renewable energies for power generation:

1. The Ministry of Energy and Mineral Development (MEMD) is the lead agency in the energy sector. The Ministry is responsible for policy formulation, promotion, coordination, monitoring and evaluation. MEMD is also responsible for initiating legislation in the energy sector. Uganda's National Energy Policy is so far centralized, i.e. there are no energy officers at sub-national / district level. Part of MEMD is the Energy Department (ED), which is structured according to sectors. ED comprises four divisions "Energy Efficiency", "New and Renewable Energies", "Electric Power" and "Provision with Oil Products".
2. Rural Electrification Agency (REA) functions as the secretariat to the Rural Electrification Board, which realizes MEMD`s rural electrification plans as stipulated in the Indicative Rural Electrification Master Plan. REA controls public funds as regards the subsidization of rural electrification projects.
3. Electricity Regulatory Authority (ERA), which was established by the Electricity Act of 1999, is in charge of issuing licenses for generation, transmission, distribution or sales of electricity. ERA also has the mandate to establish a tariff structure and investigate tariff charges and approve the rates of charges.

Regarding biomass, the New and Renewable Energies Division of the MEMD has been coordinating the dissemination of improved cookstoves and other biomass technologies. The private sector association "Biomass Energy Efficient Technologies Association" (BEETA), Consisting of mainly improved biomass stoves businesses is one more institution advocating biomass issues and gaining strength by the day.

1.4 Major donor activities

Uganda has a large community of international development partners in the energy sector, who coordinate activities through the Energy and Mineral Development Partners Group (EMDPG) which Germany is leading since November 2010.Most development partners focus on the supply side of the power sector as well as electricity transmission and distribution. A new field of support is the oil and gas sector after discovery of fossil resources in the country. German Development Cooperation and Energising Development are the ley partners of the Ugandan Government in the field of access to modern energy services (electricity and biomass energy). At present, the following institutions and countries are represented in this working group: KfW, GIZ, USAID, DFID, EIB, EU-Commission, France, Ireland, IWF, AdDB, JICA, Norway and World Bank. Other institutions supporting the Ugandan energy sector include: NORAD, IAEA, USTDA, IDB, UNDP, UNIDO, NDF and SIDA.

2 Planned outcome

Energy service segment	Old targets		New targets	
Energy for lighting and electric household appliances	29,000	people	12,500	people
Cooking energy for households	1,100,000	people	600,000	people
Electricity and / or cooking energy for social infrastructure	194	institutions	200	institutions
Energy for productive use / income generation	240	enterprises	100	enterprises

3 Project approach

3.1 Energy technologies and services promoted by the EnDev project

The main technologies promoted by EnDev-Uganda are as follows:

- On-grid: connection to the centralized electricity grid
- Off-grid: dissemination of solar PV systems
- Biomass energy: dissemination of improved cookstoves

3.2 Approach to provide electricity to households

The Energy Programme Uganda has been supporting the development of the rural solar market[14] since 2007. Activities focus on strengthening rural based solar dealers in South-Western and Northern Uganda. They are supported under the "access to solar" campaign with a package of promotion and marketing as well as technical and business skills trainings. Each dealer links up with a reliable supply company for solar equipment to ensure high quality of the products. A re-financing scheme to improve liquidity of Savings and Credit Cooperative Organisations (SACCOs) is established to enable the SACCOs to provide more solar loans at a time to the customers of the solar dealers. In the future, programme activities will build upon these existing structures, while additional partnerships will be fostered to increase outreach into rural areas and broaden the scope of market players and technologies. New activities currently being assessed and prepared are for example partnerships with established picoPV distribution companies that are certified by Lighting Africa. Those market players will be supported to enforce existing distribution networks to increase market penetration.

One of the new partnerships currently being assessed is a cooperation with Barefoot Power Uganda Ltd. and the Rural Electrification Agency (REA) called "Light up a village". The objective is to provide a whole village with basic access to electricity for lighting and phone charging. Households, social institutions and small businesses will be supported to acquire at least one system of 5W (or more) each. Affordability is improved by Barefoot Power products being qualified for the solar PV subsidy provided by REA targeting all three target groups equally. The community will contribute financially at least 20% to ensure sense of ownership of the systems. The solar company guarantees a warranty time of one year and after-sales-services. In addition, the success story of the solar village will be used as a basis for promotional activities in the area. Barefoot Power Uganda Ltd. will train selected individuals from the villages to become franchise dealers for further reach out into remote rural communities. The concept of "Light up a village" is unique in Uganda – Barefoot Power Uganda Ltd. has so far implemented the first two pilot villages successfully.

In conclusion, the future activities in the area of solar market development will:

- further strengthen the network of currently supported rural dealers,
- increase the number of rural dealers supported
- create new partnerships with various pico PV distributors (e.g. establishment of rural warehouses to improve access to stock)

In September 2012, a senior consultant has visited the programme and assessed the activities. On the basis of his recommendations new partnerships will be created.

Since 2008, the GIZ Energy Programme Uganda has implemented various grid densification projects through Energising Development (EnDev). Especially the two community-based projects of Konapak and Ameni village have a positive impact on the community and act as a "door-opener project" in the area. With the associated productive use training, some shop owners have diversified business while some schools have ventured into vocational skills training, computer lessons and night classes (impacts will be assessed in 2013). Their successful completion acts as a basis of trust with local authorities and surrounding communities, which have started to prepare themselves (committee, fund raising) even before they initiate contact to GIZ. While completing those two community- based projects, the programme observed that almost 50% of the potential customers failed to connect immediately

[14] The Rural Electrification Agency (REA) is implementing a solar PV subsidy scheme to lower end-user prices called PVTMA. As most solar companies and rural solar dealers in Uganda are qualified to channel the subsidy, in order to avoid double counting only a share (one third) of the solar PV systems sold with EnDev support is counted as achievements for EnDev; next to other problems this is one of the reasons why achieving per capita investment benchmarks in Uganda has been difficult. .

due to several reasons (sub-standard house wiring, lack of funds for wiring, unfinished buildings, challenges in application process to concessionaire, etc.).

In the future, the programme plans to follow a two pillar strategy:

1. EnDev-Uganda will shift from direct implementation of grid densification projects to cooperating with the Rural Electrification Agency (REA). The role of programme is to prepare project areas (site identification, survey studies and mobilization of communities and local authorities) to be implemented by the Rural Electrification Agency (REA) according to their community-based approach. These joint projects will have the function as a "door-opener"" to foster trust and long term cooperation on district level. In early 2012 a survey to identify new grid densification project areas has been completed and 4 projects identified.
2. Based on these new and the two already completed grid densification projects, EnDev-Uganda will introduce so-called "follow-up consultants" in the respective districts. Those local consultants will built-up a close cooperation with the district and local leaders to identify communities that are located at existing low-voltage lines, but have failed to connect to the grid. The consultant will assist potential electricity customers to go through the procedure to apply for a connection with the local service provider, bundle several applications and ensure quality of house wiring. The pilot phase of this new pillar of the approach is currently on-going and some immediate success stories are already registered with more than 20 additional connections in process within a few weeks.

In conclusion, the future activities in the area of grid densification will:

- Cooperate with REA by preparing grid densification projects and handing them over to REA for implementation (door-opener projects)
- Assist potential customers in areas where low-voltage lines are in place, to get connected to the centralized grid.

3.3 Approach to provide clean cooking technologies to households

In the previous two phases of EnDev's ICS programme, 14 districts of Uganda have been covered, over 7,000 artisans trained in peri-urban and rural areas and about 25 companies and artisans trained in urban areas. In all, over 700,000 households, 300 social institutions and 150 SMEs acquired improved cookstoves.

However, detailed sustainability studies and reviews indicated that in peri-urban and rural areas, which represent the majority of the households, rates of new adoption and replacement of stoves as well as maintenance practices are considerably lower than required to maintain the level of dissemination.

Previous strategies

In urban centres and for institutions and SMEs a commercial approach with some price subsidy was adopted. In peri-urban and rural areas however, where the focus of the intervention was, a socially oriented approach, referred to as the "Pyramid" approach, was adopted: selected NGOs were trained by the project on stove construction and contracted to disseminate stoves. The NGOs established a pyramid structure in every district they covered by selecting and training a district coordinator who was charged to select and train a sub county coordinator for each sub county covered in the district. These sub county coordinators trained and coordinated both parish level coordinators and village artisans (2 per village), selected by the village heads.

Stove dissemination at village level was done in a massive roll out. Often, all households in a village were covered and stove artisans were financially supported by the NGOs. Though in principle households were supposed to pay a token amount to the stove builders, by and large the stoves were understood and practiced as free gifts to the households. Once the targeted villages were covered the NGO moved to another location until their engagement

with the project ended. Thereafter, stove dissemination activities of the project substantially diminished. There were only rare and intermittent market development and awareness creation activities by the project in these districts.

This strategy undermined market development by devaluing the stove through free distribution while the total coverage of villages left the artisans no immediate business prospects after the roll out. Quality control and enforcement was hampered by the massive roll out in a short time-span, by the multi-layered structure for training and supervision and by the lack of consumer empowerment through market mechanisms.

Proposed strategies

For the urban centres, the purely commercial approach will be further enhanced, providing technical and marketing support without direct price subsidy. The Biomass Energy Efficient Technologies Association (BEETA), of whom most of the stove businesses in the major urban centres are members shall be further supported to play a lobbying and normative role. The Technical Advisor that is to be placed in BEETA through another GIZ instrument shall also provide essential input. The on-going cooperation with the Centre for Research in Renewable Energy and Energy Conservation (CREEC) at Makerere University shall be further enhanced to develop, verify and promote stove standards.

For peri-urban and rural areas, drawing lessons from the past and taking into account recommendations from the sustainability studies that suggested a more commercial approach, the project has designed an commercial approach based on social marketing principles. Rural artisans shall operate according to commercial principles and shall be supported by enhanced and coordinated marketing support through partnerships, and with the local community, the local administration and locally operating partner NGOs.

In the 14 district where earlier interventions took place, some 1500 previously trained artisans were identified. For them re-orientation and refreshment trainings were designed and are given, in order to implant the concept of commercial operation. The project will empower artisans that stand out, either in stove quality or in business performance, to franchise or form a formal producers group with other artisans to expand their business. In the long run, depending on performance and potential, these businesses will be supported in diversifying their portfolio with other compatible energy services.

In six new intervention districts, into which the project is up-scaling, from the start focus will be on establishing businesses referred to as “Energy Service Providers” (ESPs) that provide the community with improved cookstoves and accompanying maintenance and repair services on commercial terms. Potential artisans shall be selected by predefined criteria and an elaborate selection process, already agreed up on by all stakeholders. To limit time and resources to high potentials, two to three artisans shall be pre-selected per Sub County and trained in technical and entrepreneurial skills, to be able to provide quality service.

This approach has been successfully employed in several public interest marketing interventions such as in reproductive health and malaria eradication. Also in the EnDev context there are successful examples like Ethiopia and Kenya where this strategy has proven to create sustainable stove businesses.

By the end of the new phase at least 350 Energy service providing businesses that commercially disseminate improved cookstoves in the rural areas and at least 40 Stove SMEs in the urban centres shall be providing full-fledged services. At least 121,000 households and 130 social institutions and SMEs will acquire improved cookstoves sustainably.

To resolve the challenge in data collection and follow up encountered in the previous strategy as a result of the lack of record keeping at the artisans level and the multilayer reporting structure, a stove production and sales data collection and processing system is put in place, whereby the stove businesses keep records and report to the program monthly. The programme shall closely monitor the market development for effective steering.

To foster this regime, enhanced and informed involvement and local influence of the technical government organs, mainly the district environment officers and the district community development officers (as there is no energy structure at district level) is being mobilized. Through these officers the district administrative hierarchies are being sensitised and supported to develop and implement supportive directives and by laws.

3.4 Approach to provide access to modern energy services for social institutions

Under EnDev 1 and at the beginning of EnDev 2 the approach to identify and select social institutions to be supported in acquiring solar systems was handled mostly directly by the programme by approaching individual private institutions (as schools) or selected districts. One main challenge was, that the energy sector in Uganda is not decentralised, hence, districts do not have a dedicated energy budget. In consequence, districts interested in supports failed to raise the required financial contribution. A second challenge faced in the past, is that requests for support were received one-by-one over a long time period – making project planning more complex.

Therefore, the programme has established a new cooperation structure with the Office of the Prime Minister (OPM). After the war that affected Northern Uganda, the Ugandan Government is making an effort to reconstruct the region for example by improving infrastructure. In this context OPM is implementing the Peace Recovery and Development Programme (PRDP) facilitating districts with funds. GIZ Energy programme has partnered with OPM informing the districts, that they can use these funds for their financial contribution to solar PV systems for social institutions. Five districts in Northern Uganda have welcomed this opportunity and have already budgeted for these funds in the binding work plans for the financial year 2012 / 13.

3.5 Approach to provide access to modern energy services to SME's

The approaches described above focus on households as the main target group, but SMEs will benefit as well from the interventions.

Especially in the field of access to electricity, apart from households also SMEs will purchase solar PV systems.

4 Expected impacts of the project intervention

Impact	Possible indicators
Environment	Contribution to the slowdown of deforestation: due to the stoves promoted in this phase, more than 140,000 tonnes of fuelwood and corresponding 10,000 hectares of forest will be saved
Health	Reduction of respiratory tract and eye infections caused by hazardous smoke emissions from traditional inefficient stoves: More than 400,000 people benefit from reduced exposure to toxic smoke due the smoke reduction through the use of the improved cookstoves Improved health services in rural health centres: Access to electricity facilitates night emergency services and improves standard of living of staff
Poverty / livelihood	Improved household savings: more than 80,000 households reduce their fuelwood consumption and thereby reduce their expenditure for fuelwood by at least 40% Improved savings in institutions: More than 150 institutions and SMEs reduce their expenditure for fuelwood by at least 60% Foster productive use of energy for income generation: SMEs generate income from productive use of energy
Education	Enhanced awareness and understanding of students: the awareness and understanding regarding renewable energy issues of students in target schools is enhanced Improved educational services: schools with access to electricity provide classes and study time in the evenings, offer additional classes and the standard of living of staff is improved
Governance	Empowerment of district officials and social leaders to contribute to the promotion of renewable energy: district officials and community leaders develop by laws and ordinances in support of the dissemination of improved cookstoves and solar PV technologies in their districts

5 Budget

	EUR
1 Human resources and travelling	465,000
2 Equipment and supplies	340,000
3 Funding financing agreements / local subsidies	150,000
4 Other direct costs	781,308
5 Total direct costs	1,736,308
6 Mark up costs / administrative overheads / imputed profit	263,692
7 Cost price	2,000,000

G. New country proposals

Cambodia

Project phase	12 / 2012 – 12 / 2014					
Project budget	EUR 2,000,000					
Target groups	Small-scale farmers in up to twelve provinces in Cambodia					
Expected outcome at project end					old target	new target
Number of people	Energy for lighting and electric household appliances					13,200[15]
	Cooking energy for households					45,315[16]
Number of institutions or enterprises	Electricity and / or cooking energy for social infrastructure					
	Energy for productive use / income generation					
Promoted technology	[ ] Solar	[×] Biogas	[ ] Stoves	[ ] MHP	[ ] Grid	[ ] Other
Summary of key interventions and outputs	EnDev will support the NBP (SNV) in a first phase of the transition of an ODA driven biogas plant market into a commercially viable market supported by carbon funding, by: 1. Strengthening the private sector supply side actors. a. Train new Biogas construction Companies (BCC's) and masons b. Transition of BCC business models into commercial franchise models, inc. the responsibility for local promotion and marketing efforts. c. Establish business association for policy development, and in future capacity building and quality assurance 2. Support demand side market development by awareness raising and general promotion on provincial level 3. Create a permanent credit scheme for biogas plant construction investment 4. Support client empowerment by role out of Biogas User Networks (BUN) in all villages of BNP 5. TA support alongside the biogas plant value chain. 6. Construction of 9.500 biogas installations					
Coordination with other programmes	IFAD PADEE					
Lead political partner	Ministry of Agriculture, Forestry and Fisheries					
Implementing Organisation	SNV in cooperation with GIZ office in Cambodia					
Implementing partners	National Biodigester Programme (NBP)					
Project manager	Name: Christoph Messinger Mail: christoph.messinger@giz.de					

[15] 87% of the biogas users use, additional to cooking, the excess gas for lighting. The capacity allows for 1,5 hours of adequate room lighting. A minimum of 5 hours is required to fullfill lighting needs. Outcomes are therefore counted proportionally.
[16] 80% of the biogas users use the plant for 100% of their daily cooking needs. 20% only partially. Outcomes are calculated as 90% of the commissioned biogas installations. (5,3 people per HH)

1 Situation analysis

1.1 Energy situation

Cambodia is a developing country emerging from decades of civil conflict and economic stagnation, but is experiencing impressive economic growth since the mid-1990s. Despite this significant progress, the country remains one of the least developed in Asia.

Cambodia is a net importer of fossil fuels such as gasoline, diesel, heavy oil, fuel oil, and kerosene. Fossil fuel is used for transport and electricity generation. More than 90% of the electricity supply comes from generators. Even the batteries that rural households use for lighting are charged at diesel-powered charging stations.

On the other hand, the vast majority of the rural population has to rely on biomass for energy supply, mainly firewood and charcoal for cooking. As in most ASEAN countries (Association of Southeast Asian Nations), biomass energy plays a major role in satisfying the rural demands in Cambodia. Besides fuelwood, an estimated 167 ktoe of agro-industrial residues, such as rice, sugarcane, maize and cattle excreta, are also available as fuel. Biomass is also used in the industrial sector for copra drying and rice husks in bakeries, brickworks and other commercial establishments.

While Cambodia is one of the poorest countries in the world, its electricity tariffs are among the highest in the world, reaching as high as EUR 1.00 / kWh in rural areas compared to approximately EUR 0.15 / kWh in Phnom Penh, or even EUR 0.05-0.08 / kWh in Thailand or EUR 0.02-0.08 / kWh in Lao PDR and Vietnam.

Currently, only 6% of Cambodia's rural population has access to grid-based electricity, mostly from village micro-grids that are often powered by inefficient diesel generators; and 80% use kerosene lamps or fluorescent lights powered by car batteries, which ends up costing an equivalent of about EUR 1.55-2.70 / kWh. There is no nation-wide electricity grid but isolated grid "islands" only, which are not interconnected.

This energy situation creates a severe problem for domestic energy consumption as well as for the natural resources. 83% of the total population and 94% of the rural population depend on biomass fuels, including firewood and charcoal, as their main cooking fuel. This places a heavy burden on Cambodia's natural resources and is having severe environmental and socio-economic implications for the country. Cambodia after Nigeria and Vietnam has the third highest deforestation rate in the world. With an average need of 8 kg of firewood per household per day for cooking purposes families spend a considerable amount of time for collecting wood (not rarely two hours per day) or have to pay substantially when buying it. The cost of fuel for cooking is a major drain on family income. The rural poor spend about 10% of their consumption expenditure on energy needs with cooking energy needs representing 70% of the total energy spending[17]. It is obvious that this means a significant obstacle regarding the socio-economic development of the poor.

Use of renewable energy technologies (RETs) will be the most appropriate way in meeting the energy demand in rural and remote areas of Cambodia, especially in off-grid areas. The government of Cambodia is placing great emphasis on rural electrification, on-grid where possible, and off-grid using renewable energy, to raise the living standards of the rural population.

1.2 Policy framework, laws and regulations

Against the background of the above described energy situation, the Royal Government of Cambodia (RGoC) has adopted policies with regard to rural electrification and the use of renewable energies.

17 The rural population predominantly buys fuelwood, since due to rapid deforestation the collection of firewood becomes more and more difficult and time-consuming.

The government, in 2006, approved the Rural Electrification by Renewable Energy Policy. Its main objective is to create an enabling framework for renewable energy technologies to increase access to electricity in rural areas. The policy acknowledges the Master Plan Study on Rural Electrification by Renewable Energy in the Kingdom of Cambodia as the guiding document for the implementation of projects and programmes. The Master Plan for the Rural Electrification Strategy (RES) envisions:

- to achieve a 100% level of village electrification, by having access to electricity of at least one of the different forms including access to minigrid and off-grid electricity and battery lightning, by 2020;
- to achieve a 70% level of household electrification with grid quality electricity by 2030

One of the four main components of the Rural Electrification Strategy is “Renewable Energy (Solar, Wind, Mini- / Micro Hydro, Biomass, Biogas, Biofuel etc.)”.

Also in 2006, the Government approved the Renewable Electricity Action Plan 2002–2012 (REAP). The REAP aims to provide cost-effective and reliable electrification of rural Cambodia through renewable energy technologies. The Plan is being implemented by the Ministry of Industry, Mines and Energy (MIME). The REAP is expected to provide electricity to over 145,000 households and commercial entities through installation and operation of 10–17 MW of renewable generation capacity.

From the above it becomes obvious that a country-wide supply of energy through a national grid is not envisaged and that decentralised energy supply and a strong focus on the use of renewable energy has priority. That means that the rural population cannot expect to be provided with electricity for cooking energy needs in the foreseeable future, but instead has to refer to locally available sources of - if possible renewable - energy. While kerosene and gas (LPG) are common sources for cooking energy for many households, those families with at least a small number of animals can meet most of their energy needs by producing biogas. The introduction and dissemination of the use of biogas systems, carried out by the National Biodigester Programme (NBP), therefore matches that situation perfectly.

NBP also fully fits within other national priorities. The Cambodian Millennium Development Goal 7, ensuring Environmental Sustainability (indicator 7.9), aims to reduce fuelwood dependency. NBP is the only programme according to the Council for the Development of Cambodia (CDC) that significantly contributes towards reducing fuelwood dependency and deforestation.

One of the main goals of the Cambodia’s National Strategic Development 2009-2013 is poverty reduction and economic growth through enhancement of agriculture sector development by ensuring food security, increasing incomes, creating employment and by improving nutrition status for all people. NBP contributes to achieving this goal by linking animal farming with crop and rice cultivation; thereby closing nutrient loops, preventing soil erosion, boosting crop yields and maintaining soil fertility. This will also help creating resilience of the agricultural sector against climate change, a key priority of the Cambodian National Adaptation Programme of Action to Climate Change (NAPA).

Other national priorities include gender mainstreaming and empowerment, as well as climate change. NBP activities help to achieve these goals as women benefit mostly from the improved indoor air quality (by using clean cooking gas) and the time savings associated with faster cooking and avoidance of fuelwood collection.

Based on the above mentioned Strategic Development Plan and its objective of agricultural sector development, the Ministry of Agriculture, Forestry and Fishery (MAFF) became the project holder of the NBP. That ownership is, however, not based primarily on the energy aspect but on the link between biodigesters and animal waste treatment: the NBP is accordingly attached to the Department of Animal Health and Production (DAHP).

1.3 Institutional set-up in the energy sector

Under the RGoC there are three main institutions having responsibilities in the energy sector. This is foremost the Ministry of Industry, Mines and Energy (MIME), which as a policy maker is responsible for planning, development, technical standards, tariffs, licenses and the review and evaluation of investments. The Ministry has a General Directorate of Energy, under which there are departments for energy technique (DET), energy development and hydropower. The DET is the focal point of the Government's efforts to develop renewable energy, energy efficiency and technical standards in the power sector and beyond.

Together with the Ministry of Economy and Finance (MOEF) MIME jointly owns on the business level 'Electricité du Cambodge' (EDC), which is the main supplier of grid-based power supply. The third major stakeholder on political level is the Electricity Authority of Cambodia (EAC), which is the regulatory body to enforce regulations, rules and standards and controls finances and performance of energy suppliers.

On the political level two more ministries have become active stakeholders: the Ministry of Environment (MOE) with its Climate Change Department with Japanese support is just in the process to develop a first NAMA (National Appropriate Mitigation Action), comprising energy efficiency, biogas and solar energy.

The major stakeholder for all issues related to renewable energies in Cambodia is the respective department at MIME. It also has expressed explicit interest towards a closer cooperation with the NBP.

1.4 Major donor activities

ADB: 13 projects in energy sector, among them Rural Electrification Project, Power Transmission and Distribution Projects; Energy for All Initiative (E4A). The country partnership Strategy 2011-2013 prioritizes five sectors not including energy.

World Bank: ASTAE (with disbursement of EUR 140,000, 2008-2010); Rural Electrification and Transmission project (2003); Renewable Energy Development Project (2003)

EU: Switch-Asia Project: Waste to Energy for the Rice Milling Sector, EUR 2,152,546, with SNV as co-funding and implementation partner; Energy for Life

JICA: Project of Operation and Maintenance of the Rural Electrification on Micro-Hydropower in Mondul Kiri Province

People in Need (PIN), Czech Republic: Financial support to NBP

UNIDO: Agricultural Residue Biomass for Sustainable Energy Solutions; Rural Energy for Productive Use and Income Generation

IFAD: Project for Agricultural Development and Economic Empowerment; therein: Pro-Poor Biodigester Design and Dissemination Component of EUR 2.3 million with SNV co-funding EUR 0.54 million. This project is implemented by NBP; it targets poor farmers with only one head of livestock, needing a special type of small biodigester with less than 4 m^3, project will be conducted as from late 2012 for 2.5 years in five provinces only.

GERES: Dissemination of improved domestic cookstoves; Manufacturing "green" charcoal; Establishment of renewable biomass energy

2 Planned outcome

Energy service segment	Old targets		New targets	
Energy for lighting and electric household appliances	0	people	44,000	people
Cooking energy for households	0	people	50,350	people
Electricity and / or cooking energy for social infrastructure	0	institutions	0	institutions
Energy for productive use / income generation	0	enterprises	0	enterprises

3 Project approach

3.1 Energy technologies and services promoted by the EnDev project

In rural areas of Cambodia, more than 90% of the people depend on traditional sources of fuel for cooking. Wood and charcoal in 2010 accounted for 69% of the total energy demand[18], contributing to Cambodia having the third highest deforestation rate in the world (after Nigeria and Vietnam). Replacing fuelwood by biogas means a saving of around 8 kg of wood per household per day, which – based on the current number of almost 20,000 biogas systems – amounts to a saving of about 60,000 t of trees.

Especially women and children are exposed to harmful fumes in their kitchens when cooking with fuelwood. The average energy costs and time to collect these fuels are a substantial burden for women and children. As their farming practices are mostly based on an integrated system combining crop production and animal husbandry, biogas has the potential to provide an improved livelihood for the rural households. Successful expansion of biogas application will also reduce pressure on the forest as demand for wood and charcoal will be reduced.

Cambodia has an enormous potential for domestic biogas plants. It is estimated that around 25%[19] of the rural households have enough animals to feed the smallest digester of 4m³ size[2] which can produce enough biogas to meet the cooking needs of one average family. This means a technical potential of 500,000 plants.

The technology promoted by NBP is a fixed dome model that has its roots in the Indian Deenbandhu model and is selected through an independent assessment of the main digester models in the region. The Cambodian biodigester model, named the “Farmer’s Friend”, is modified to better match the Cambodian conditions. In a biodigester biogas is captured in an integrated gasholder and subsequently stored for cooking and lighting. The effluent from the biodigester, bio-slurry, is a high potential organic fertiliser.

The target group of the programme are those households having the technical potential to operate a biogas plant on a daily basis. This means they should have at least 20 kg of animal dung (equivalent to three cows or buffalos) to feed a plant of the smallest 4 m^3 design or 150 kg for the largest 15 m^3 design[20] (range of programme-supported biogas systems). The programme anticipates to develop even smaller biodigesters (in different construction techniques like reinforced fiberglass) in order to be able to offer biogas use to even rather poor farmers having one or two livestock only.

[18] SNV: Selection of Renewable Energy technologies for scaling up in Cambodia; December 2011

[19] Based on animal census data of the NGO veterinaries without borders, the total potential is 500,000 households. The market potential is estimated to be around 19% of all households, or 76% of all households with the technical potential (GERES, 2010)

20 All attracting the same flat rate subsidy of USD 150

The National Biodigester Programme (NBP), under the coordination of the Ministry of Agriculture, Forestry and Fisheries (MAFF), has been implemented since 2005, and by the end of 2012 will have implemented almost 20,000 domestic biogas plants, covering just 4% of the potential market. Since 2005 the programme has grown from an initial coverage of four provinces to currently twelve provinces, and annual construction of units has increased from a few hundred in the first years to around five thousand per year now. The actual biogas plant construction capacity at the end of 2012 lies in the range of between 6,000 and 10,000 systems per year, depending on the availability of masons, weather conditions and size of plants. The most limiting factor is the availability of sufficient funds for the investment subsidy paid per plant.

The programme adopted a multi-stakeholder sector development approach', involving besides the national office various provincial authorities, the private sector (for construction), financial institutions (MFIs), NGOs (for training and implementation in selected provinces) as well as the users themselves (in establishing user networks for promotion, experience sharing and appliances distribution). With regard to the overall objective of establishing a self-sustaining and market driven national domestic biogas sector, NBP in the second phase of the programme will introduce well-considered changes towards transferring more and more responsibilities to the various stakeholders and market actors.

The annual Biogas User Surveys (BUS), conducted by a third party and verified by a Designated Operational Entity (DOE), show that over 99% of the biogas plants built since 2006 are in use and over 80% of the biodigester households are no longer in need to use fuelwood or charcoal for their domestic energy needs. The programme will scale up the number of biogas systems for households to increase access to and use of a clean and safe renewable energy technology mainly for cooking, but also for lighting (substitute to electricity). It is a surprisingly high 87% of all new biogas clients that from the beginning also use biogas lamps (mostly two), using the gas left after cooking. With the gas production continuously on-going, the average duration of use for the first lamp is almost 1.5 hours and for the second one still more than one hour.

Additionally, the application of the digested slurry as potent organic fertiliser will increase agriculture productivity substantially. And the benefits are significant: the comprehensive biodigester user survey of 2012 shows that the average family saves EUR 100 per year on energy[21] (2200 kg / year in fuelwood), while in average over EUR 35 per year is achieved by replacing chemical fertilisers with bio-slurry (up to EUR 100 per hectare).

With the EnDev funding, the NBP will maximise biodigester dissemination in the existing programme provinces, particularly the high production provinces surrounding Phnom Penh city and the Mekong River. This implies that the programme will cover 10 to 12 of the total of 24 Cambodian provinces.[22]

The smallest plant size, 4 m^3 now cost about EUR 500[23]. After subsidy the average client's payment was EUR 380. The average plants size in 2006 was 6.94 m^3, but dropped in the course of the programme to 4.7 m^3 for the first half of 2012. The decreasing size of the plants

[21] Most families meanwhile have to buy their buy their fuelwood since the expenditure of time for collecting it becomes higher and higher due to rapid deforestation. The actual situation of "buy or collect" is very much depending on the local and regional natural conditions.
[22] The provinces not included do have a too small biogas potential for running a project
[23] This is the sales price to families and excludes programme overhead costs which are now partially still dependent on ODA funds but which will by 2018 be entirely covered by revenue generated through carbon sales.

constructed indicates that the programme reaches the smaller farmers in the market who have less dung and are more in need of investment credit. The average size is expected to stabilise at the current level.

A female biogas user standing in front of her new biodigester.

The Cambodian 'Farmers Friend' model biodigester is based on the Indian Deenbandhu design. The building technique can easily be learned by rural masons.

3.2 Approach to provide electricity to households

Not relevant for this proposal

3.3 Approach to provide clean cooking technologies to households

The programme's overall long-term objective is the establishment of a self-sustaining, market driven national domestic biogas sector. As it is obvious that such objective cannot be achieved from scratch within a few years, the first phase of the NBP programme from 2006 to 2012 concentrated on the promotion and dissemination of domestic biodigesters as an indigenous, sustainable household energy source for cooking (and lighting). The second phase of the programme from 2013 to 2018, and particularly in the transition phase 2013 to 2014) will now introduce more and more market orientation and respective mechanisms in order to achieve an organisational and financial sustainable biogas sector. In organisational terms the NBP in its first phase has e.g. introduced the concept of Biogas User Networks (BUN) as well as the creation of certified Biodigester Construction Companies (BCC), both of which will form an important structural basis the for sustainability of biogas activities. In financial terms, NBP was successful in registering the biogas programme as a Gold Standard Project in 2011. This has resulted in initial voluntary market carbon revenue already.

The EnDev funding for the period 2013-2014 comes in at the crucial beginning of a transition phase from depending on ODA funds towards self-sustainability from carbon revenue. During this period, NBP will be able to finance already close to 30% of the total budget from carbon revenue.

Parallel to the annually increasing number of biogas plants, the increasing amounts of carbon revenue will lead in coming years to a respective decreasing demand for ODA and a prospective financial sustainability of NBP in 2018. As the price for carbon credits is volatile, no exact figures can be presented here. Unexpectedly the revenue from selling credits will be higher in 2013 than originally planned. Financial sustainability of NBP therefore might be even achieved before 2018. However, and that is important to consider, the biogas programme would not at all achieve sustainability if it would have to more or less cease activities at the end of 2012 due to lack of external funding support. It is just this situation at which EnDev is required to come in with a "bridge funding" of 2 years to keep the NBP going.

Once NBP made progress becoming financially sustainable, the organisational set-up will be reviewed and adjusted. The objective remains that NBP should become an entity independent from external funding and being a driving force in the sector of renewable energies. Experience from other countries show that NBP could register e.g. as a social business (serving the entire biogas market with expertise and services) or as national NGO like a Cambodia

Biogas Association (assembling all relevant stakeholder and actors in this sector). The various options will be explored in detail after securing funding beyond 2012.

With the construction of almost 20,000 domestic biogas systems in Cambodia in its first phase (2006–2012), the National Biodigester Programme has created a sound basis for the further development of the sector and the establishment of a sustainable biogas sector. The increasing demand from farmers for biogas systems serves as proof that biogas is considered as a source of clean cooking energy for rural households, that provides financial benefits (savings from not buying firewood and chemical fertilisers) as well as health benefits (less smoky kitchens, workload reduction especially for women and improved sanitation through toilet attachments). Although farmers have to pay more than 75% of the total cost of a biogas plant by their meagre income, they take the decision to invest in biogas plants since they are convinced about the advantages to their livelihood.

The second phase of the programme (2013–2018) will now put emphasis on the stabilisation and improvement of the sector's structures, placing emphasis on commercialisation, and the objective to achieve financial sustainability: with the increase in annual carbon revenues the need for ODA to run and manage the programme will become less until it can be financially independent from ODA by 2018.

Biogas development under NBP aims to arrive at a market driven sector. There are several fundamental parts involved that make the programme achieve the above overall objective. The following explanations will shed light on the current working system of the NBP and will also indicate the direction of the necessary steps and measures to proceed on the way to a sustainable biogas sector.

In the first phase (2006–2012) a quality management system with quality auditing and maintenance services was developed. Besides that, strengthening the capacity of commercially and non-commercially operating actors to perform their respective roles in the process enjoyed particular emphasis. A strategic choice was made to keep certain tasks and functions within the direct control of NBP. This was done in order to keep the price of plants affordable, to cover part of the programme operational costs and household investment costs with ODA funds, which are to be replaced gradually with carbon revenue. The first phase has succeeded in passing the entire Gold Standard registration process which allows the programme to sell the carbon credits for up to 21 years (three cycles of seven years) per plant.

During the coming transition phase (scale-up phase, 2013-2014) the programme will develop the "Proof of Concept" that biodigesters can be sold commercially in Cambodia. Therefore the second phase will concentrate more on further strengthening of the biodigester supply chain and the role of each actor in that system.

The programme will start to introduce changes from the current practice to new modalities. NBP will start to transform its institutional set-up by focussing mainly on facilitation, capacity building and quality enforcement. This includes capacity development for rural entrepreneurs (biogas construction companies) in a business model in terms of focusing on strong promotion and marketing, a reliable after sales service system, the empowerment of end users and ensuring the provincial biodigester programme structure would take full ownership and concentrates on its important role in promotion and quality enforcement.

Market development: supply side

Private sector development (BCC development) is one of the main activities of the programme as BCCs represent one of the two core elements of a future sustainable biogas sector. With currently 40 commercially operating Biodigester Construction Companies (BCCs) covering eight provinces and up-coming 25 new BCCs in another three provinces in the last quarter of 2012, the programme will, from 2013 jointly with a Local Capacity Builder (LCB), select about 30 masons with entrepreneurial potential, provide them with extensive training, assist them with the registration of a BCC and provide company specific coaching services for a period of two years.

Moreover, in this transition period the programme gives priority to develop and strengthen the capacity of existing BCCs to operate within a micro-franchise model (accredited and certified by NBP). The companies then can market, construct and perform after sales services[24] for biogas plants in a business model (BCC set their profitable cost). This will lead to a profitable, fair market competition without programme-fixed labour cost, profit margins and geographical limitations. There is no fixed number of plants that BCCs can construct per month. Their experience is that they would need to build between ten and 20 biogas systems per month in order to achieve a satisfying income from their business. In the past, the profit margin was defined by NBP at a rather low level. From 2013, this issue will be handled more flexible to support the BBCs' business character. It is obvious that BCCs cannot charge exaggerated prices as they would lose customers to competitors or shy away potential clients at all. On the other hand a certain minimum number of plants per month (estimated as ten units) are necessary to keep the masons fully employed (otherwise trained masons drop out for finding better paid jobs elsewhere). The number of masons per BCC depends on the market situation. If a BCC employs only a few masons it may not be able to meet the demand. If a BCC employs many masons it may not be able to give them enough work. The maximum capacity is limited also (apart from the availability of masons) by the necessary marketing activities. A BCC owner has to closely supervise his construction sites while parallel finding new customers. Some BCCs already have found that appropriate balance between the different tasks. They serve meanwhile as promoters among their colleagues.

At the beginning of the programme, it was necessary to build up a promotion and marketing force that would be disseminating the concept of biogas use among the livestock farmers. It was then a very reasonable decision to refer to the provincial structure of the umbrella ministry MAFF. In each province MAFF has a Department of Agriculture with a unit for Animal Health and Production which on the national level is the "host" of the NBP. The programme made use of this structure and trained in each programme province several animal health workers to become biogas promoters (and technical supervisors). Moving towards commercialisation in the second phase of NBP, this system of promotion and marketing meets its limits in terms of capacity and procedures. Under a sustainable business model, the provider of a service or product will have to become responsible for the marketing of his offerings.

[24] Details beyond the already introduced warranty period, maintenance visits and spare part distribution system are to be elaborated together with BCCs

This will open business opportunities and reduce the dependency on the marketing activities of others persons. With the beginning of the second phase the programme therefore in selected provinces will start to carefully transfer local promotion and especially marketing activities from the provincial PBPO to selected BCCs[25]. Such system then will reflect the objective of introducing a sustainable business approach, which will lead to more ownership and will open up possibilities for the BCC to increase their turnover.

The programme intends to assist BCCs in establishing their own business association (details about it have yet to be developed together with the BCCs), enabling the members to directly involve the private sector in programme policy development. Furthermore such an association can be used for institutionalising certain BCC capacity building activities through peer exchange on best practises. Also a BCC association can take on activities as internal quality control on delivered goods & services and the importation and distribution of appliances which are not manufactured in Cambodia.

Finally the programme will introduce appropriate mechanisms (like more intensive quality control and closer supervision) to ensure the proper functioning of the plants and the after sales services in poor performing provinces to safeguard farmer's benefits and to comply with the Voluntary Gold Standard of carbon credit.

Market development: demand side

Being a market driven programme, the (potential) biogas users are at the other core element of all programme activities. The image illustrates the user position and the programme activities directly involving the market. The general promotion on provincial level has to intensify. Some provinces show already how to cooperate with other programmes and how to involve a variety of stakeholders. Such best practises will be taken up and spread among less well performing provinces.

NBP's client-oriented strategy

The programme will need to address a certain competition from sellers of LPG stoves and continuous rumours about a likely grid connection in remote villages. Even then, in case of access to grid-based electricity, running a biogas system provides for real savings on energy cost and high quality fertiliser, while using electricity for cooking would lead to unbearable cost[26]. But the alleged perspective of getting electricity for "unlimited" light and TV is so attractive that households save money for the expected grid connection instead of investing in a biogas plant. This fact has to be disseminated to potential clients in an active way by provincial promoters and BCCs.

[25] Based e.g. on past documented performance and the results of the on-going coaching through CIEDC (Cambodian Indian Enterprise Development Company), which has developed a complex system to select BCCs. NBP also will organise a 2-days workshop in November 2012 with all BCCs attending to develop details for the future business model.
26 Even where poor farmers are connected to any kind of grid, they still use firewood or kerosene for cooking.

Taking into consideration inevitable inflation and a suitable profit margin for a BCC, an increase in the cost of biogas plants is anticipated. Including a slurry hut (as an integrated element of a biogas system) and connected toilet facilities the total cost price for a 6m³ plant for a farmer may reach up to EUR 600. Considering the flat rate (investment subsidy to household of EUR 120) the average client's payment would be around EUR 480.

Micro credit provision and subsidy

NBP in its aim to introduce biogas as a renewable and clean energy predominantly for cooking purposes has supported the financial efforts of the farmers by providing a flat rate subsidy per biogas plant of EUR 120, independent of the size of the plant. Experience from the field shows that many small farmers would not be able to fully finance the cost of biogas system, but need the subsidy to bear the investment. The subsidy serves as well as a tool for safeguarding quality standards on plant construction and after sales services.

Most of the potential clients do not have the financial capacity to invest in a biodigester without the possibility to access credit. Regular consumptive micro-finance credit in Cambodia is too expensive with 2.5% interest per month on full principal with a maximum running time of one year. Therefore the programme is supported by a credit facility from the Netherlands Development Finance Organisation (FMO) through two national Micro Finance Institutions (MFIs), which allows interested farmers to get a credit at favourable conditions.

1.2% interest per month on reclining principle and two years running time are acceptable conditions for most potential clients. Currently about 70% of all new biogas owners make use of this micro-credit facility.

With FMO and other financial partners, a model will have to be developed to come to a permanent credit scheme for biogas plant construction investment. The existing credit scheme will continue up to 2017.

Client empowerment

To empower individual clients in the operation and maintenance of their plants as well as in their relation with construction companies, the programme has started in 2011 on a limited scale the set-up of Biogas User Networks (BUNs). The objectives of BUNs are to “enable biogas users to ensure proper plant operation and maintenance, to gain full economic benefits from using their biodigesters and to assist persons interested in purchasing a biogas plant to make a well-informed decision.” This objective shall be achieved primarily by:

- involving existing biogas users in the promotion of biogas plants
- encouraging mutual support among local users
- increasing biodigester users’ knowledge on plant operation and maintenance and the use of bio-slurry through training and sharing of best practices among users
- ensuring that guarantee services within the warranty period of two years are provided on time and of an adequate quality
- ensuring the accessibility of spare parts e.g. through establishing core farmers with stocks of spare parts

This is a new approach in national biogas sector development in the Asia region. Based on the experiences gained, BUN development is expected to be implemented in all villages covered by the NBP programme. This component is implemented by the programme's partner, the Czech INGO People In Need (PIN), which conducts the above mentioned activities.

Technical Assistance

It can be expected that the development of the domestic biogas sector in Cambodia towards the end of the second project phase (2013 – 2018) will reach a level of maturity where TA will no longer be required.

During the 2013-2014 period the TA will be needed for the following topics:

- Assistance in developing and introducing new modalities, procedures etc. to NBP;

- Assistance in strengthening the capacity of BCCs towards the privatisation of marketing, construction and after-sales service activities;
- Assistance in the establishment of a BCC association that would be responsible for BCC coordination, promotion and appliance management and distribution etc.
- Assistance in the expansion of the Biogas User Network (BUN) pilot scheme to cover the whole programme area, together with People in Need (PIN);
- Strengthening knowledge brokering and international networking activities of NBP;

To fully cover the above TA requirements, various specialised senior advisors (international) will be required for a total of up to 24 month (to be paid for by EnDev contribution).

Furthermore the programme will require TA (to be paid from carbon revenue) to support the on-going and recurring Gold Standard-related procedures of NBP, leading to financial autonomy of the programme; (to be paid from carbon revenue).

Conclusion

With financial support from EnDev for the period 2013-2014, the programme will be able to initiate the construction of totalling about 9,500 biogas units with a total number of 50,350 people as direct beneficiaries. Furthermore 30 construction companies (BCC), about 150 masons as well as 15 new technicians / technical supervisors would be trained.

3.4 Approach to provide access to modern energy services for social institutions

Not relevant for this proposal

3.5 Approach to provide access to modern energy services to SME's

Not relevant for this proposal

4 Expected impacts of the project intervention

Impact	Possible indicators

Environment	• the projected 9,500 biodigesters, with a minimum lifetime of 15 years, are able to reduce annually:
	  ○ Firewood: 23,750 tons;
	  ○ CO_2 emissions: 39,900 tons;
	  ○ Kerosene: 255,000 litres.
	• replacement of chemical fertilisers by organic bio-slurry
	• reduced pollution of surface water with livestock manure

Health	• Indoor Air Pollution will be reduced by 99%, thereby improving considerably the health status of the biogas families. Especially women and children benefit from a reduction in respiratory and eye illnesses caused by harmful kitchen smoke. • Improved hygiene and sanitation through 570 toilets attached to the biodigester. • The risk of burning accidents caused by cooking on open fire will be reduced by 50%. • Workload reduction of 2.2 hours a day on average contributes to health improvements.

Poverty / livelihood	• Improved quality of life and status for 9,500 Cambodian households (50,350 people) through provision of clean energy for cooking and lighting; easier cooking practices; smokeless kitchens; and cleaner farmyards; • Annual reduction of fuel expenses: EUR 950,000 • Annual reduction of expenses on chemical fertilisers: EUR 360,000 • Annual time reduction in collecting fuelwood, cooking, and utensil cleaning: 760,000 man days* • Creation of permanent jobs (for masons, supervisors, trainers, other programme and partner staff, e.g. MFIs): 1,000 jobs during project period. • Increased agricultural production for 85% of the biogas users through the use of potent organic bio-slurry. • Empowerment of women through the recognition of women's situation in drudgery and declining health due to traditional cooking practices; through their involvement in plant investment decision-making; through their participation in NBP activities (e.g. training, promotion, BUNs).
Education	• Several types of trainings will be provided through the programme (e.g. on biodigester construction for masons, business development services for companies, promotion training for partner staff (total 1,000 people) and operation and maintenance for biogas users, especially women (minimum 9,500 people), which all lead to an overall improved education level. • Biodigesters save on average per day 2.2 hours per family, which can be used for educational purposes. • Biogas lamps can provide several hours of light in the evening for studying: 87% of all clients buy gas lamps (mostly 2) and use them regularly in the evening (using the available gas after cooking)
Governance	One of the general aims is the institutionalisation of the biogas sector within the Government of Cambodia. Programme implementation activities are decentralized to provincial level with Departments of Agriculture hosting the provincial programme offices in eight provinces.

5 Budget

5.1. GIZ budget

	EUR
1 Human resources and travelling	0
2 Equipment and supplies	0
3 Funding financing agreements / local subsidies	1,865,866[27]
4 Other direct costs	20,801
5 Total direct costs	1,886,667
6 Mark up costs / administrative overheads / imputed profit	133,333
7 Cost price	2,000,000

[27] see 5.2

5.2. SNV budget

	EUR
1 Human resources and travelling	627,599
2 Equipment and supplies	708,534
3 Infrastructure / vehicle	436,027
4 Administrative overhead of the NGI	93,706
5 Total cost	1,865,866

Indonesia biogas

Project phase	12.2012 – 12.2014					
Project budget	EUR 1,150,000					
Target groups	The core target group are Business Service Providers consisting of constructors, maintenance providers, manufacturers and biogas training and promotion providers in Java. Biogas users (female and male farmers of cattle, pigs and poultry) and their family members are target customers of the initiative, contributing at least 60% of the market price of a digester.					
Expected outcome at project end					old target	new target
Number of people	Energy for lighting and electric household appliances					
	Cooking energy for households					20,000
Number of institutions or enterprises	Electricity and / or cooking energy for social infrastructure					
	Energy for productive use / income generation					
Promoted technology	[ ] Solar	[×] Biogas	[ ] Stoves	[ ] MHP	[ ] Grid	[ ] Other
Summary of key interventions and outputs	Interventions • build and strengthen capacity of more than ten biogas service providers • promotion of biogas among potential users • quality Inspection and accurate monitoring using comprehensive MIS • build appliance manufacture sector and maintain quality Outputs • 4,000 cattle farming families have invested and own their own biodigester • 100% of digesters work well • at least 95% satisfaction rate among users • over 70% of households have cleaner kitchen and better environment					
Coordination with other programmes	• BIRU programme (co-finances) • UNEP-FACET • Nestle Creating Shared Values Programme • National and Provincial MEMR offices					
Lead political partner	Ministry of Energy Mining Resources (MEMR), Directorate General for New Renewable Energy and Energy Conservation (DGNREEC)					
Implementing Organisation	Hivos in cooperation with GIZ					
Implementing partners	SNV; Yayasan Rumah Energi (local biogas foundation)					
Project manager	Name: Dr. Rudolf Rauch Mail: rudolf.rauch@giz.de					

1 Situation analysis

1.1 Energy situation

Traditional cooking fuels (biomass, kerosene)

Around 25 million households in Indonesia rely on biomass as their primary cooking fuel. The majority of these are located in rural areas of Java. Firewood is the primary cooking fuel for rural households, followed by kerosene. Figures vary by region, but roughly two-thirds of the rural households in the target area Java rely on firewood as their primary cooking fuel, approximately one-quarter rely on kerosene, and the remainder (approximately 5%) use LPG as their primary fuel.

Where firewood is readily available, studies suggest that farmers often do not value the labour expended to collect firewood, and therefore perceive the price of biomass to be low. In addition to absorbing time, however, the collection of firewood depletes natural resources and damages the environment. The burning of traditional fuels also exposes household members to smoke and causes respiratory illnesses and eye ailments. Indonesia ranks second among East Asia and Pacific countries in mortality attributed to Indoor Air Pollution (IAP) from solid cooking fuels, which has been estimated to cause over 45,000 premature deaths in Indonesia annually. IAP is an issue that particularly affects women and children.

Kerosene continues to be highly subsidised. In the 2008 national budget, a total of IDR 126 trillion (about EUR 10.5 billion) was allocated for subsidy on fuel. The subsidy allocated for kerosene alone amounted to about IDR 30 trillion (about EUR 2.5 billion). It has been estimated that the greenhouse gas emissions of household kerosene could be substantial for appliances like stoves and lanterns, given their prevalence in developing countries (Lam, 2012). While kerosene has sometimes been categorised as a ‘clean’ fuel, the WHO notes that it contributes to Indoor Air Pollution, and is a cause of chronic pulmonary disease.

Pre-existing situation for biogas

Indonesia has strong potential for the development of a domestic biogas sector. Key supporting factors identified in a 2008 feasibility study by SNV included favourable climate conditions, availability of water, and large numbers of livestock (particularly cattle) farmers with sufficient numbers of animals stabled at least overnight. Meanwhile, the relatively high per capita incomes compared to other countries where SNV works, taken together with data on the typical size of loans accessed by farmers, suggested a good ability to pay for digester construction. The SNV study estimated a market potential of over one million households on Java and Bali, areas with relatively high densities of cattle farmers where zero-grazing is widely practiced and water is generally available. More recent calculations suggest that the technical market potential in fact exceeds two million households.

Despite the large potential market for biogas among livestock farmers in Indonesia, the sector has seen very limited development since biogas technology was first introduced in the 1970s. In 2009 only about 6,000 small plants had been built for individual and communal use. National and local governments sponsored the majority of installations; initiatives by the national Department of Agriculture and Ministries of Cooperatives and Environment dating back as far as 1981 were responsible for over 3,000 biogas installations, and a further 2,000 or so were sponsored by local governments in Java. NGO, cooperative and CSR initiatives were responsible for most of the remainder.

A 2008 feasibility study found that most existing biogas plants had been heavily subsidised and poorly maintained. While all major biogas designs had been tried, plastic bag digesters, which had been heavily promoted in recent government programmes, only had an operational lifetime of approximately two years in the field. In areas where biogas had been heavily promoted and subsidised, farmers often had negative perceptions of the technology and expected that it would be provided for free. These attitudes naturally presented a significant challenge for market-based approaches to biogas dissemination.

In addition, the study identified that capacity and willingness to pay for biogas installations was strongly related to the availability of credit and the perceived return on investment for farmers. The study calculated that farmers would be interested in paying for biogas plant construction when their financial internal rate of return was around 19%. For those using firewood, it was estimated that this would require a subsidy of IDR 2,000,000 (EUR 167) between 23-37% of the cost of a biogas digester, depending on its size. Additional benefits of biogas, such as bio-slurry and health improvements, were not factored into the calculation, as farmers unfamiliar with the technology did not often perceive these wider benefits.

On the supply side, the limited success of biogas development in Indonesia meant that there were hardly any actors in the sector. Appliance manufacturers were limited to one manufacturer producing fiberglass digesters. Only a few biogas construction agencies existed, together with a handful of NGOs or cooperatives that had taken individual biogas initiatives. There was a lack of skilled human resources, in particular of masons with the capacity to install and provide after sales for quality biogas installations.

The Indonesia Domestic Biogas Programme

The Domestic Biogas Programme (BIRU) was established in 2009. It is implemented by Hivos and SNV with funding from the Royal Netherlands Embassy. The overall development objective of the BIRU programme is to disseminate domestic biodigesters as a local, sustainable energy source through the development of a commercial, market oriented sector in selected Indonesian provinces. The programme employs a multi-stakeholder sector development approach. Typically operating on a time horizon of ten years, key components of a national biogas programme include the development of construction and after-sales services, training and extension, promotion and marketing, credit provision, quality control, R&D, programme coordination, policy coordination and M&E.

The mechanism for biogas dissemination employed in the first phase of the BIRU programme involves the provision of an investment subsidy to farmers of IDR 2 million (EUR 167), or approximately 23% to 37% of the market price of a biodigester (depending on its size). Participation agreements are concluded with construction partner organisations (CPOs), including companies, cooperatives and NGOs, and farmer investment incentives are channelled to CPOs on completion of clearly specified plant installation and servicing tasks. Dairy farmers on Java have been a key market in the initial phase of the programme, as the nature of the sector means that they are well organised in cooperatives, and have routine dealings with them.

Some of the main contributions of the BIRU programme to the development of the biogas sector in Indonesia to date include:

- Construction and after sales services. Over 40 CPOs will have developed around 8,000 units in eight provinces by the end of 2012. In stark contrast to previous highly subsidised programmes, these fixed dome digesters have a minimum lifetime of 15 years and require user contributions of over 60% of the market price. Digesters are covered by a 3-year warranty and CPOs make at least two follow-up visits in this time.
- Training and extension services. Biogas users receive standard trainings in operation and maintenance from CPOs. They are also trained in bioslurry management. In addition, over 650 masons and supervisors have been trained and certified in biogas plant construction. These hands on trainings are provided by BIRU programme staff and consultants to masons nominated by CPOs.
- Credit provision. Around 80% of all constructed plants have been financed by micro credit, primarily through partnerships that the BIRU programme developed with Nestle and RABO Bank Foundation. However, the majority of potential biogas users continue to lack access to credit at affordable prices. Access to credit has therefore been identified as a key issue limiting expansion of the BIRU programme.

- Research and development. An in-depth biodigester design study was conducted at the outset of the BIRU programme drawing on domestic and international experiences. Standard designs for 4m3, 6m3, 8m3 and 12m3 fixed dome digesters were developed. The success of the programme in constructing large numbers of functional digesters, which attract user satisfaction ratings in excess of 90%, has been instrumental in convincing national and local governments of the benefits of fixed dome digesters over other less satisfactory designs.

1.2 Policy framework, laws and regulations

Domestic biogas replacing firewood and kerosene (and to a lesser extent LPG) is highly relevant to current Government of Indonesia (GoI) policies and programmes, combining renewable energy development, emissions reduction, reduction in deforestation, and reduction of subsidy on fossil fuels.

The following are a number of key policy instruments and decisions that display alignment of GoI policies and targets with the aims of the BIRU programme:

- A Ministerial Decree on policy on renewable energy development and energy conservation was released in 2004. The goal of the decree was to ensure the security of energy supply, enhance the use of renewable energy, and promote a more efficient, reliable, diversified and environmental friendly use of energy.
- The 2007 Energy Act stipulates the utilisation of energy resources and national energy management to meet the objective of sustainable development and energy security. The Act stresses that every citizen has a right to energy services that the availability of energy is the responsibility of the state, and that energy resources shall be controlled by the state and utilised for the welfare of the people.
- A Presidential Decree (*Perpres*) No. 5 / 2006 on National Energy Policy aimed to ensure energy supply security for the country by reducing the share of oil fuels in the energy mix from 51% to 20% and increasing the share of renewable energy from 4.5% to 17% by 2025.The 17% target for the share of renewables was subsequently superseded by the so-called *Visi 25 / 25*, announced in 2009, in which the government committed to achieving a 25% share for renewable energy by 2025. This new, more ambitious target was intended to stimulate investment in renewable energy.
- Presidential Decree (*Perpres*) No. 24 / 2010 established the Directorate General for New Renewable Energy and Energy Conservation (DGNREEC) under the Ministry for Energy and Mining Resources (MEMR) with the aim of focussing energy conservation and diversification efforts. The DGNREEC is now the key counterpart for the BIRU programme within the MEMR.
- Presidential Decree (*Perpres*) No. 61 / 2011 on a National Action Plan for the Reduction of Greenhouse Gas Emissions specifies that greenhouse gas emissions should be reduced by 26% through domestic efforts, and by a total of 41% when these are supplemented with foreign support.

In the last few years, Indonesian government programmes to promote renewable energy have included a number of fuel substitution programmes. In 2007, the government launched a ‘substitution of kerosene to LPG programme’ targeting mainly households in Java and Bali, with the aim of reducing spending on subsidies for kerosene. Under this programme, the government planned to distribute millions of free 3kg LPG tanks and stoves to poor households. The government also provided a subsidy for the 3kg LPG tank. However, the requirement to pay for LPG and the lack of stock of canisters in many rural areas has hindered uptake. Government initiatives have not yet led to significant penetration of LPG in rural areas, where firewood continues to be the primary cooking fuel, followed by kerosene.

The West Nusa Tenggara provincial government has also established a collaboration with the BIRU programme in which it procures materials for digesters through local government tender.

1.3 Institutional set-up in the energy sector

Cooperatives. Cooperatives are a key gateway for accessing the livestock farmers who are the target market of the BIRU programme. These membership organisations are an effective route for identifying potential biogas customers, conducting promotion and marketing, and in some cases can also support access to credit. Cooperatives are also eligible to participate in the BIRU programme as Business Services Providers, and a number have used this as an opportunity to develop biogas divisions and provide biogas services to their members.

Business Service Providers (BSPs) are legally registered companies, entrerpreneurial groups, or cooperatives with business units that provide biogas services. BSPs include Construction Partner Organisations (CPOs) who construct biogas digesters and provide after sales services. The development of entrepreneurial actors to construct and service biogas plants for the domestic market is an essential element of biogas sector development. The BIRU programme has so far led to the development of more than 40 CPOs.

Microfinance Institutions (MFIs) include credit providers or local micro-finance providers that have partnered with the BIRU programme. Currently large segments of the target market in rural areas do not have access to credit at affordable rates of interest.

Appliance manufacturers. Appliance manufacturers can be individual producers, organised home industry, and SMEs. Prior to the BIRU programme, none of the essential appliances for the proposed biogas installations was manufactured locally. The programme has supported the development of appliance manufacturers that can supply biogas appliances.

National government agencies. The Indonesian Ministry of Energy and Mineral Resources, Directorate General for New Renewable Energy and Energy Efficiency (DGNREEC), Directorate Bio-Energy is a key counterpart for the programme, and has provided strong support. It chairs the six-monthly BIRU programme advisory committee, and has allocated funding and provided hands-on support to launch the BIRU programme and conduct meetings with stakeholders in a number of different provinces. Despite difficulties created by government tender procedures, the DGNREEC is keen to provide financial support for the expansion of the BIRU programme, and has committed to provide funding for farmer investment incentives in this programme. This is reflected in the budget.

Local governments have the potential to act as biogas promoters, including through programmes funded with local budgets. The BIRU programme, along with a limited number of other biogas programmes, has played a role in helping to put biogas on the agenda of local authorities. In particular, it has helped to demonstrate the benefits of fixed dome digesters and the importance of user contributions and ownership. Local authorities are actively involved in the national biogas advisory committee for the BIRU programme, and have provided support for liaison with authorities in other areas. The district government of Malang in East Java, one of the key operating areas for the programme, has also demonstrated its commitment by providing office space for the BIRU programme team.

BIRU programme. Local BIRU programme teams are responsible for monitoring activities, liaising with government, partnership monitoring and quality control. They play a crucial role in monitoring appropriateness and quality of biogas construction, and support collection of preconstruction agreements, household agreements, completion reports, after sales services reports and quality inspection reports. Data is input and tracked in a BIRU programme MIS. Local teams also support bio-slurry activities, including bio-slurry business development. A national programme unit conducts overall programme coordination and stakeholder liaison.

1.4 Major donor activities

NGO programmes. A significant number of biogas digesters have been built by NGOs with a community development and / or environmental mandate, with funding from the government, institutional donors or Corporate Social Responsibility (CSR) funds. The most prominent international organisation to play a supporting role was the Bremen Overseas Research and Development Association (BORDA). A number of local NGOs, including LPTP and their

private sector subsidiary DEWATS in Solo, Bali Fokus, and the Tangerang-based NGO BEST, have learned how to build efficient digesters and developed a considerable number of digesters. The BORDA project has likely triggered the construction of over 1,000 digesters.

Corporate donors. In recent years, a number of companies have allocated CSR funding to support the production of limited numbers of biogas digesters in their operating areas. CSR donors that have supported the development of biogas digesters include the multi-national Danone, and NEC and Chevron in West Java.

Donor programmes. In addition to the BIRU programme, a limited number (hundreds) of digesters have been built under the Dutch-funded CASINDO programme. Activities are also under preparation by YBUL foundation in Riau and Central Kalimantan under the Finnish funded EEP programme. The World Bank-funded PNPM community empowerment programme has also supported the development of a few hundred digesters, mostly through contracts with BIRU programme construction partners, who occasionally provide their services to local governments. The World Bank, ADB and MCC are looking into clean cookstove initiatives, which may include biogas, but these are all in a preliminary stage.

National and local governments. National and local government agencies continue to be among the most active biogas 'donors', through tendered programmes that often wholly finance plant construction. This on-going practice of providing digesters to households free of cost can create great difficulty for implementation of market-based approaches. It is also self-defeating, as experience in Indonesia and elsewhere clearly shows that it limits client ownership and sustainability of biogas installations. One private sector actor (PT SVEN), which produces fiberglass digesters, has been successful in obtaining many orders from national and local governments. The company claims to have made around 2,250 units since its existence. Private sector and government are also working on larger scale biogas installations, for example digesters fed by palm oil effluent from plantations.

2 Planned outcome

Energy service segment	Old targets		New targets	
Energy for lighting and electric household appliances	0	people	0	people
Cooking energy for households	0	people	20,000	people
Electricity and / or cooking energy for social infrastructure	0	institutions	0	institutions
Energy for productive use / income generation	0	enterprises	0	enterprises

The EnDev programme aims to build 4,000 additional digesters over two years, starting in East Java in the first year and expanding to the rest of Java in the second year, at an average total cost of around EUR 860 per digester (incl. programme spend and farmer contributions).

3 Project approach

3.1 Energy technologies and services promoted by the EnDev project

Technologies and services promoted

- **Biogas digesters.** The BIRU programme has developed standard designs for fixed dome digesters from $4m^3$-$12m^3$ (based on farmer need). The fixed dome digester was selected following an in-depth study and based on international and domestic experience. The key argument in favour of the design is the long technical life of a fixed dome plant (minimum fifteen years), compared to a floating drum plant or plastic bag

digester, the latter of which has a typical lifetime of just six months to two years in the field.

- **Biogas appliances.** All required materials for masonry biogas plants are available, including appliances developed locally with market based financing from the BIRU programme. These include biogas stoves and lamps, gas taps, pipes and others. Only one item (the main gas valve) is not yet produced locally to a sufficient standard. New rounds of standardization for a number of appliances are anticipated in the future.
- **Biogas construction services** are provided by CPOs, with quality control from the BIRU programme team. After sales services include user trainings, maintenance visits, and a 3-year warranty. CPOs receive training to enable them to conduct user trainings. Bioslurry trainings are also provided to users by CPOs or by BIRU programme staff.
- **Mason trainings.** The programme provides trainings on biogas plant construction for masons and supervisors. These hands-on trainings, which are key to ensuring construction quality, take around eight days and are attended by about twenty masons and supervisors nominated by CPOs. They are arranged by the programme, and conducted by BIRU Quality Inspectors together with an experienced mason or supervisor. Technical consultants from Bandung-based partner TEDC have also provided trainers.
- **Access to credit** is essential. Around 80% of current BIRU customers fund their purchase through credit. This was facilitated by partnerships with RABO Bank Foundation and Nestle to provide credit through cooperatives. However, large segments of the potential market still lack access to credit at affordable rates (below approximately 16%). The programme will continue to work with other donors, banks and rural microfinance institutions to support the development of credit services for biogas customers.

Intervention areas

The intervention will target rural areas in Java, starting in East Java in 2013 and rolling out to the rest of the island (primarily West and Central Java, and DKI Yogyakarta) in the following year when initial funding for these areas expires. Java is targeted for the implementation of enhanced market-based approaches in the proposed programme because it boasts the largest potential market for biogas in Indonesia, has relatively low materials and logistic costs, and has fairly well developed networks of cooperatives and farmer groups. The island accounts for 87**%** of biogas plants developed so far in the BIRU programme, and has seen by far the strongest progress in the development of biogas services.

Distribution model

The BIRU programme adopts a multi-stakeholder sector development approach to biogas dissemination.The approach is based on the establishment of a market for domestic biogas installations and accessories. It envisages that a well-informed demand side – clients who know what they want, recognise quality and value for money – is linked with a capable supply side that can provide quality products and after sales services at competitive prices. Such a market should be able to reach a volume that allows a significant number of constructors and credit providers to maintain a profitable turnover.

In addition to the main market actors, government, civil society organisations, 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 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.

Strategy for sustainability

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, credit, R&D and an enabling policy environment. Hivos and SNV seek 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, standardization and promotional support.

Local institutionalisation of core programme functions, including quality control, monitoring and sector development support is also being promoted through the establishment of a local foundation. The current programme set-up is dependent on Hivos, which staffs and manages the national and provincial programme offices. In 2011 the Indonesia Netherlands Association (INA) conducted a study on possibilities for local institutionalisation. It proposed to set up a local foundation to take over management responsibilities in the future. In the first years, Hivos and SNV would remain involved to ensure that programme quality and momentum is maintained, and proper management is ensured. It is anticipated that the foundation, to be called *Yayasan Rumah Energi*, will be up and running at the beginning of 2013. In the first instance, it will assume responsibility for provincial programme unit functions, including liaison with stakeholders, training, support for R&D activities, quality control, extension, monitoring and promotion support. In 2013 the current role of Hivos as programme proponent under the carbon mechanism will be devolved to this new foundation and Hivos will become carbon buyer, allowing the foundation to pump carbon revenues directly back into the programme. Over a number of years, Hivos and SNV will gradually withdraw from the foundation, leaving behind a fully localised management unit, responsible for monitoring and implementing biogas activities and with the mandate to sell carbon credits.

The financial sustainability of the programme is predicated on a number of factors. The approach anticipates a reduction over time of external support for farmer investment incentives and programmatic support. As programme functions are institutionalised by local actors, there will be a reduction in average programme spend per digester. Investment incentives will also be gradually reduced, and farmer contributions will increase. At the same time, external funding will in part be replaced by sustainable local funding sources, including carbon emissions financing. It is also anticipated that the Indonesian government will provide interim funding to support farmer investment incentives.

- **Farmer contributions.** In the first phase of the programme, a flat rate investment incentive of IDR 2,000,000 (EUR 167) was offered to farmers to stimulate demand. This equates to 31% of the average cost of a digester. By 2014, it is anticipated that the farmer investment incentive will be reduced to 24% of average digester cost, while by 2017 it is projected that the investment incentive will cover only 12% of the cost of a digester. With a transition from donor / government funding to the use of carbon funding for investment incentives, this level of subsidy is regarded as sustainable.
- **Carbon emissions financing.** Long-term income from emission reduction sales will support the financial sustainability of the approach. The BIRU programme is developing a Gold Standard certified carbon credit mechanism under the voluntary market. This mechanism is expected to be registered before the end of this year, and operational in 2013. The mechanism relies on farmers conferring their rights to claim emissions reductions to the programme. Revenues will be used for continuation of biogas activities (provision of incentives to farmers, quality control and technical assistance).
- **Government.** The Indonesian government, through MEMR DGNREEC, has committed to providing funding for the biogas programme from 2013. This funding will in part

support the provision of investment incentives in the proposed EnDev programme. This is reflected in the proposed budget.

- **Donor funding.** In 2012, the average donor spend per digester was EUR 583, and accounted for 100% of external funding for the programme. As programme functions are institutionalised, average programme costs per digester will be reduced. These are projected to decline to 26% of their current levels by 2018. Farmer investment incentives will also be reduced to half of their current levels over this period. Meanwhile, carbon funding will also contribute to programme and subsidy costs. By 2018, it is anticipated that donor or GoI funds will only account for 15% of funding for the programme.

Use of subsidies

- Investment incentives (for farmers). Investment incentives will be provided to farmers in the proposed programme, although it is planned that these will now be gradually reduced over time (to half of their current levels by 2018). Demand-side interventions are still required in the early phase of biogas dissemination in order to overcome the challenges posed by subsidised fuels, limited farmer recognition of the benefits, and a history of wholly subsidised (and often failed) interventions. They also serve to compensate customers for surrendering the rights to claim their emissions reductions.
- R&D incentives. The programme will continue to use advance market commitments (agreements to purchase a pre-specified volume of product at a pre-agreed price) as a way to stimulate local production of improved biogas appliances. These will be field tested and certified for use in the programme as appropriate. Two rounds of standardisation will be conducted, with a focus on: water drain; galvanized pipe with gas valve, kitchen gas tap; mixer; manometer; gas stove and gas lamp. The development of a well-functioning and efficient biogas stove, for example, requires continuous efforts. The programme will test each new stove and only allow stoves that show improvements to be disseminated among biogas users.

3.2 Approach to provide electricity to households

Not relevant for this proposal

3.3 Approach to provide clean cooking technologies to households

The programme promotes biogas digesters and appliances, including biogas stoves. As a clean cooking technology, biogas is economically attractive to the user, being powered through waste and producing bio-slurry. It is also highly sustainable, with a digester minimum life of 15 years for the promoted technology. In addition to the health and environmental benefits of reducing emissions from wood and kerosene cookstoves, biogas also significantly reduces emissions through improved manure management, reduction in deforestation and replacement of chemical fertilizer with organic bio-slurry.

Digester construction and aftersales services

The core of the biogas dissemination model is that eligible farmers operate and maintain biogas plants constructed and serviced by Construction Partner Organisations (private sector, cooperatives or NGOs). CPOs are also responsible for providing user trainings in operation and maintenance of biogas digesters.

In order to ensure quality, the BIRU programme maintains tight controls on customer verification and digester siting, materials and prices, and construction quality. The duties of CPOs are outlined in contracts with farmers, and farmer remunerations to CPOs (less their investment incentive) are based on the terms of these contracts. The farmer investment incentive is channelled directly to the CPO by the BIRU programme on verified completion of work. A comprehensive MIS is used to track digester construction, quality of digesters, and mason and partner performance. This allows for proper verification of incentive eligibility.

The proposed programme, which will be implemented in East Java starting 2013, and rolled out to the rest of Java in 2014, will remain close to this tried and tested dissemination model,

which allows the BIRU programme to maintain strong controls on the quality of the offering. This is a basic premise of the sector development approach, and it is not yet something that the market is mature enough to guarantee.

Demand-side interventions are still required to overcome the challenges posed by subsidised fuels, limited farmer recognition of biogas benefits, and a history of wholly subsidised (and often failed) interventions. Farmer investment incentives will be retained in this programme. However, following the phase out strategy outlined above, they will be reduced from Rp. 2,000,000 (EUR 167) to Rp. 1,750,000 (EUR 146) in 2014. Farmers will also pay a slightly higher price due to an increased management fee for CPOs, discussed below.

On the supply side, a modest increase in the management fee for suppliers is intended to bolster the business case and stimulate greater entrepreneurship. It is apparent that limited profit on the current pricing model has not sufficiently incentivized entrepreneurial behavior by CPOs. Strong controls on pricing in the first phase of the BIRU programme have led to a situation in which CPOs can only make very limited profit on digester construction, while some have even operated on a loss. In the existing scenario, a typical supplier can achieve break even with the construction of 80 digesters annually. Many produce below this level, leading to financial problems, though they still remain partners in order to be able to enjoy training and other forms of support. The failure of many to actively market biogas is a symptom of this problem. The consequences of limited profitability have also been seen in slower growth in areas where better performing CPOs have reached the majority of more easy to reach and / or wealthy customers but have yet to generate sales among the second tier. Under the EnDev programme, digester pricing has been modified to permit improved profitability, enabling a typical CPO to achieve break even with the construction of 50 digesters annually.

Training services

Biogas training services include in particular user and mason trainings**.** Basic biogas technology skills development for biogas users is done through user training on digester operation and maintenance, and bioslurry management training. Dissemination of knowledge is currently done through Training of Trainers for partner organisations, which are tasked with conducting user trainings with support and monitoring from the BIRU team.

Since biogas is a new sector for most actors, mason trainings are key to ensuring good construction quality. The development of human resources is essential for the establishment of a functioning biogas sector, and the production of certified masons is a key programme output. Formalization of certification is currently under discussion with the government. So far, the programme has trained around 650 masons and supervisors on biogas construction techniques, although only around 350 remain actively involved in construction of digesters. It will continue to work to develop a pool of skilled and qualified personnel to sustain the sector.

Credit services

The programme has seen considerable success in developing collaborations with Nestle for the provision of credit (at 0% interest) to members of its client cooperatives in East Java. Nestle has allocated around 2.3 million EUR for these loans, of which 50% has now been used. 47% of the outstanding loans have already been repaid. Nestle is committed to continue its cooperation with Hivos, at least for the upcoming two years.

The Dutch RABO Bank Foundation (RBF) also partnered with Hivos to provide credits for biodigesters through cooperatives in West Java with an interest rate of 8% (effective). However, the number of MFIs and cooperatives reached has so far been limited. Even so, RBF and Hivos are working intensively to enhance the outreach to other lending partners, including in East Java (focusing on the non-dairy sector). An extension of the cooperation agreement between RBF and Hivos is currently under discussion.

The programme has learned that working with a large Indonesian banking agency, willing to provide small loans to farmers or to develop partnerships with rural microfinance institutions,

is a better option for scaling-up. It is estimated that interest rates of over 16% are unlikely to be attractive to farmers, although it is likely that the initial costs of banks or rural MFIs in extending services to biogas customers will push up the costs to farmers. For this reason the programme is collaborating with the UNEP FACET programme and its partners like Bank Sharia Mandiri (and possibly BNI), who can support the extension of credit to farmers at affordable rates. Implementation is scheduled to start before the end of 2012.

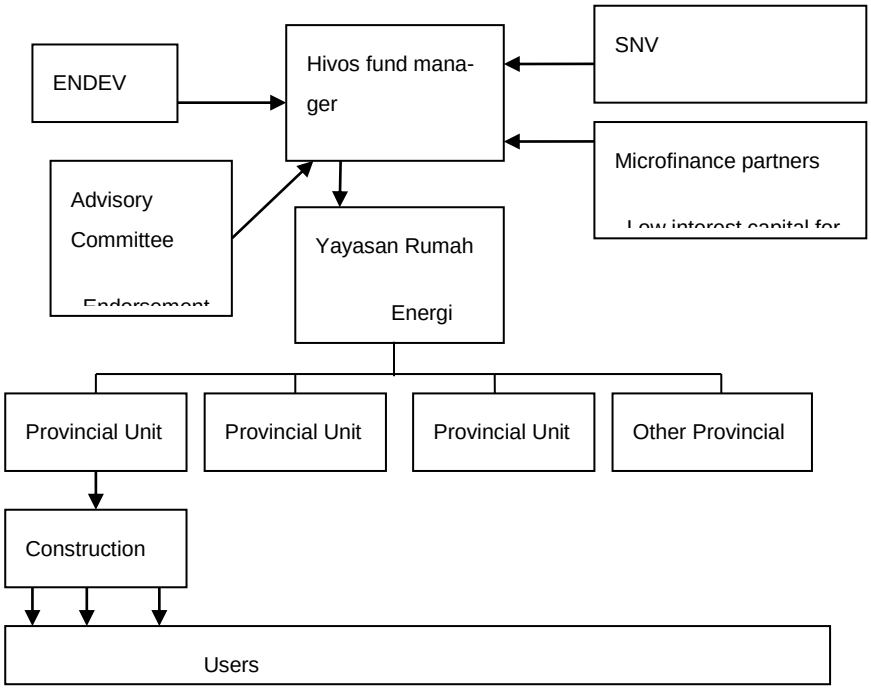
Research and development

Prior to the BIRU programme, none of the essential biogas appliances for the proposed biogas installations was manufactured locally. The programme successfully stimulated R&D of biogas appliances through applying advance market commitments, resulting in the local development and manufacture of all but one of the essential biogas appliances. Two further further rounds of appliance standardisation will be conducted in the proposed programme, with a view to supporting further design and quality improvements. In relation to biogas cookstoves developed under the programme, for example, combustion efficiency and quality of the materials, including the gas regulator, can use further improvement.

BIRU programme setup

Since biogas technology has not been operational in many parts of Indonesia, market development needs a phased approach. Since 2009, a start has been made in regions with the most positive technical and financial potential to develop domestic biogas markets. This first phase of the BIRU Programme was funded by the Royal Netherlands Embassy, and implemented by Hivos with knowledge transfer and technical assistance from SNV.

Figure 3.2. Programme implementation structure



The programme has adopted a decentralised set-up, with a national programme unit in Jakarta, and provincial implementation units that are responsible for programme coordination at the local level. Key functions of these units include programme and fund management, support for CPOs and credit providers, partner capacity building and trainings, quality control and monitoring, R&D support, local institutionalisation, and development of sustainable financing, including emissions reduction financing. Hivos will involve the new local foundation (to be called *Yayasan Rumah Energi*) as local counterpart for programme implementation, with the aim of gradually devolving implementation and management responsibilities.

3.4 Approach to provide access to modern energy services for social institutions

Not relevant for this proposal

3.5 Approach to provide access to modern energy services to SME's

Not relevant for this proposal

4 Expected impacts of the project intervention

Impact	Possible indicators
Environment	Emissions reduction Biogas replaces ever scarcer traditional wood fuel and reduces deforestation. The use of biogas reduces greenhouse gas emissions by reducing deforestation, replacing fossil fuels used for cooking and lighting, and capturing methane from cattle dung. 14,000 tons CO_2 emission reduction annually (CO_2 emission mitigation of around 3.5 tons per digester is annually 4,000 x 3.5 tons emission reduction of CO_2 for a period of at least 15 years). Carbon mechanism expected to be fully operation before the end of 2012, financed by Hivos) Monitoring The Gold Standard certified VER's mandate the use of monitoring protocols that will become part of annual user surveys. Indicators include but are not limited to: • household daily utilization of: o firewood o agriculture residues o animal dung o kerosene o LPG for cooking expressed in kg / day / household • Fuel usage before and after use of digester and differentiating between types of digesters, • Type of stove used, • Digester usage rate, • Fraction of cow dung fed into digester. Changes in these indicators in comparison to the baseline will measure the extent to which the programme has verified emission reductions. Gold Standard provides the complete methodology at their website.28 Bioslurry management Biogas installations produce potent organic slurry to be used in agriculture. This slurry improves soil fertility and thus increases agricultural productivity as well as that of fish rearing, and reduces the application and cost of chemical fertilisers. 65% of biogas recipients (at least 2,600 households) correctly apply bio-slurry in agriculture / fish rearing activities

28 http://www.cdmgoldstandard.org/wp-content/uploads/2011/10/GS_110411_TPDDTEC_Methodology.pdf

Health	Reported health impacts Biogas provides clean cooking fuel and gas for lighting, it eliminates smoke from the kitchen and thus reduces related health problems (mainly eye irritation and infections and respiratory ailments), in particular of women and children; • User survey will show at least 8% reduction in eye redness and / or irritation and respiratorial ailments during the last year, which can be compared to the baseline and previous surveys.
Poverty / livelihood	Job creation Experience has taught that in terms of job creation, the total output of digesters will have a 5% impact on jobs: 4,000 digesters leads to 200 jobs. • The programme will train 80 masons, provide short-term work (4,000 x 8 days) to 160 assistant masons (=around 100 full-time jobs) and around 40 full-time jobs in related services: banking, appliances manufacture, bioslurry business. This excludes potential bioslurry jobs and businesses. Skills development More than 80 people will have obtained certified biogas construction skills. • 80 men and women have obtained certified biogas construction skills
Education	During the programme all 4,000 households are subject to extensive biogas user training (at least one half day) and bio-slurry management training. Expectedly, all biogas households will have been trained and around 35% of the trainees are women. Where possible, each household is represented by one male and one female participant.
Governance	The biogas programme is seen as a national programme, which is shown by a strong buy in of the Indonesian government. • The government is developing steps to play a stronger role in the programme, starting with the allocation of funds. • A stronger management role of district and province level Department of Energy branches can be identified.

5 Budget

5.1 GIZ budget

	EUR
1 Human resources and travelling	40,000
2 Equipment and supplies	0
3 Funding financing agreements / local subsidies	1,000,000
4 Other direct costs	37,395
5 Total direct costs	1,077,395
6 Mark up costs / administrative overheads / imputed profit	72,605
7 Cost price	1,150,000

5.2 HIVOS budget

	EUR
1 Human resources and travelling	597,800
2 Equipment and supplies	71,000
3 Funding financing agreements / local subsidies	0
4 Other direct costs	241,800
5 Total direct costs	910,600
6 Mark up costs / administrative overheads / imputed profit	89,400
7 Cost price	1,000,000

5.3 Additional funding sources

Carbon funding mechanism

The 4,000 biogas digesters build in the proposed programme will create 4,000 x 3.5 tCO_2 emission reduction per year over a lifetime of at least 15 years, a total of EUR 1,008,000 (after reduction of commissions).

Year	# of digesters	15 yrs x EUR 21	Total (EUR)
2013	1,500	315	472,500
2014	2,500	315	787,500
Total	4,000	315	1,260,000
Minus 20% admin			252,000
Total revenues 15 years			**1,008,000**

These revenues are expected to be pumped back into the programme in order to ensure sustainability. Hivos is ready to pre-finance around 40% of this amount to facilitate the implementation of the EnDev programme, in the amount of EUR 407,750, partially for subsidies and partially for programme costs.

Indonesian government funding

The Indonesian Ministry of Energy and Mineral Resources is ready to co-finance the programme in the amount of EUR 395,833 (2013-2014). A similar amount will be spent directly by the Ministry for management, coordination and stakeholder meetings (not counted as part of the budget). This financing model prevents the government from having to tender services (apart from arranging payments through a bank).

The total financial picture of the funding sources then looks as follows:

Source	Subsidy (EUR)	Programme (EUR)	Total (EUR)	%
EnDev	0	1,001,660	1,001,660	55
Hivos / carbon	218,750	189,000	407,75	23
MEMR	395,833	0	395,833	22
Total	**614,583**	**1,190,660**	**1,805,243**	**100**

Nicaragua and Honduras[29]

Project phase	12.2012 – 12.2014					
Project budget	EUR 3,000,000					
Target groups	Poor urban and rural households, small enterprises and social infrastructure that are using firewood as fuel for cooking					
Expected outcome at project end					old target	new target
Number of people	Energy for lighting and electric household appliances				0	0
	Cooking energy for households				0	250,000
Number of institutions or enterprises	Electricity and / or cooking energy for social infrastructure				0	500
	Energy for productive use / income generation				0	500
Promoted technology	[ ] Solar	[ ] Biogas	[×] Stoves	[ ] MHP	[ ] Grid	[ ] Other
Summary of key interventions and outputs	Market Development for the Dissemination of Energy Efficient Stoves Training of Producers and Users Watershed Management and Fuelwood Production and Marketing					
Coordination with other programmes	CLIFOR (EU-GIZ), Regional Environmental Program (GIZ), UNDP-PPD, Programa Regional de Energía y Pobreza en Centroamérica (PREPCA / HIVOS)					
Lead political partner	Institute of Forest Conservation and Development (ICF), Ministry of Energy and Mines (MEM)					
Implementing organisation	GIZ					
Implementing partners	NGOs, Small and Medium Enterprises, Microfinance Institutions and Local Governments					
Project manager	Name: Klaus Hornberger Mail: klaus.hornberger@giz.de					

[29] The acitivities planned in this proposal will be integrated into the existing country measures in Honduras and Nicaragua instead of setting up a seperate regional project.

1 Situation analysis

1.1 Energy situation

The cooking energy situation in Honduras and Nicaragua is characterized by the widespread use of fuelwood. A wide traditional sector, including most of the rural and peri-urban households, but also small and medium scale and agricultural industries are covering their energy needs with firewood, wooden residues and other biomass fuels. Therefore firewood is an energy source of supreme importance in both countries, especially for the rural households. The wood fuelled stove is culturally tied to the preparation of maize dough cakes (tortillas) and beans. The importance of firewood is such that many households with access to electricity keep on using firewood as their main energy source for cooking.

In the urban and peri-urban areas of Honduras 55% of all households are using firewood, of which only 21% combine firewood with other energy sources. It is estimated that in the marginal zones of peri-urban areas more than 500,000 families depend on buying firewood for cooking on a daily basis. The population of about seven million grows at a rate of 2.5% per year. Poverty is widespread, particularly in rural areas where firewood keeps on prevailing with close to 82% of the households. Although accepted by the users, the introduction of improved energy efficient stoves has been very limited. Its current coverage is of scarcely 10% in the rural areas and of 3% in the urban areas. It is estimated that still approximately 800,000 traditional stoves do exist in the country.

The statistics of the Institute of Forest Conservation and Development (ICF) indicate more than 8 million m^3 of annual firewood consumption for energy needs by illegal cutting, contrasting with almost 700,000 m^3 of annual timber production by the legally constituted industry. Firewood is also widely used by rural small and medium enterprises principally in the extraction of salt, the production of tiles, bricks, chalk, brown sugar loafs, coffee, as well as in bakeries and potteries.

According to the study of firewood consumption produced by the Honduran Secretary of Natural Resources and Environment, the Pan-American Agricultural School El Zamorano and the Economic Commission for Latin America of April, 2011, firewood consumption per capita is 5.2 kilograms per day, with small changes between the rural and urban areas or between the households that use firewood as the only fuel and those where firewood is combined with other fuel sources. The expenses for buying firewood for its use in inefficient traditional stoves (of between 5 to 10% efficiency) has an impact on the household economy and principally of the women who devote themselves to the production of maize tortillas for sale. Family expenditures for buying firewood in the urban areas are estimated with at least two dollars per day.

In Nicaragua firewood and other biomass resources have always played an important role in satisfying the basic energy needs of the population. In 1990, according to the National Tropical Forestry Plan, firewood represented 55% of the energy consumption, charcoal 1% and crude oil derivatives 27%. In accordance with this study, the yearly firewood consumption was estimated between 1,500,000 and 1,800,000 metric tons. 89% was used in residential and commercial areas, 5% in the industrial sector and 6% was used for charcoal production. It was also indicated that 1.8 million persons used firewood as their main fuel. In the National Survey of Firewood of 2005, six out of ten households were using firewood for cooking. More recently, in spite of changes in the calculation methodology of the National Survey of Firewood, population growth and the introduction of other sources of modern energies, firewood still represents the primary energy source ranging from 48% in 2006 to 47% in 2008. Mean firewood consumption per capita was estimated to be 1.81 kg per day with a growth rate of 0.56% per year. Until today, firewood and charcoal are extracted practically entirely from natural forests. 60% of the firewood used comes from fallen branches of trees, shrubs and dried wood collected from the ground. It is considered that only 9% comes from the felling of trees and pruning.

Estimations of forest specialists indicate that from 1980 until 2002, there approximately 40,000 hectares of forest plantations have been established in the country, of which 80% are energy species and the remaining 20% are industrial species which are offered on the local and international markets.

In Nicaragua the economic activity of firewood extraction generates employment for approximately 250,000 persons and 75% of these are small and medium-sized enterprises. The majority of the forest sector actors do not realize their activities in accordance with the legal and technical framework for forest management. Consequently a sustainable production and the conservation of the resource are far from being secured.

Recent studies also indicate that the quality of commercialized firewood is rather low. It is not homogeneous in species, calorific value is low and moisture content is high. A low efficiency of only 8% in firewood and 12% in charcoal is observed by the persistence of inefficient systems of calorific transformation as the use of open stoves, semi open stoves without chimney, and other traditional stoves based on obsolete technologies, leading to inefficient combustion and considerable heat loss.

According to the population census of the year 2005, the Nicaraguan population counts 5.14 million inhabitants with an annual growth rate of 1.7% (for the period 1995-2005) The population concentrates on the urban centers of the pacific region and it is important to notice that the census indicates an increase of the population concentration in the urban areas (59%), and a clear reduction of the population in the rural areas (41%). This population growth pattern is resulting directly in rising levels of firewood consumption.

This consumption tendency has severe socio-economic and environmental implications. The environmental impacts generated by the extraction of firewood have resulted in degradation of the primary forests in extensive areas of Nicaragua, reducing wild life and quality and quantity of the water bodies. This tendency is further increased by the absence of rational land use planning for agricultural activities, provoking severe soil over exploitation.

The use of firewood in traditional open stoves has negative effects on the health of the exposed population, especially of women and children. In accordance with the World Health Organisation the use of biomass fuels in open stoves provokes premature death of approximately 1.6 million persons worldwide, due to the inhalation of pollutant gases. To this complex one has to add the collateral social problems that are linked with the handling and transport of firewood, especially the link with infantile work. Finally, the firewood demand of the urban centers and rural productive activities contribute directly to deforestation and desertification.

Improved cookstoves reduce the exposure to respiratory and cardio-pulmonary diseases, irritation of the eyes, poor fetus growth and eventually lung and liver cancer by reducing indoor air contamination. Energy efficient stoves also contribute to an improval of water supply by reducing deforestation and desertification and the vulnerability of the population to disaster risks.

It is of importance to treat the biomass energy issue in Honduras and Nicaragua from the perspective of micro watershed management, where the rural population generally lives with no access to sustainable energy sources. The promotion of improved biomass use must be linked with multi sector strategies to improve the management capacities for sustainable forest and plantation management for sustained biomass production for households and productive uses.

1.2 Policy framework, laws and regulations

Improved cookstove programs have traditionally been accompanied by an interest of actors linked with the energy and natural resources sectors and thus have initiated the formulation of policies and strategies of rational, efficient and sustainable use of biomass fuels in both countries.

In Honduras the new Forestry Protected Areas and Wildlife Law (Decree No 156-2007) establishes the legal framework for the management and administration of the national forest resources, protected areas and wildlife. It includes their protection, restoration, use, conservation and promotion, by propagating their sustainable development in accordance with the social, economic, environmental and cultural interests of the country. Article 135 of the law defines that the owners of the public and private forest areas should identify deforested and degraded areas of interest for national development and for the generation of labour opportunities. The protection and promotion activities explicitly include, among others, the plantation of energy and multiple use tree species in order to reduce the pressure on the natural forests.

In Nicaragua the sector competences of the different public institutions in the fuelwood energy sector such as the Ministry of Energy and Mines (MEM), the Ministry of Environment and Natural Resources (MARENA) the Ministry of Agriculture and Forestry (MAGFOR) and the National Institute of Forestry (INAFOR) are defined in the Law No 290 and Law No 612 and its regulative framework. The National Policy of Sustainable Development of the Forest Sector of Nicaragua (Decree No. 69-2008, approved in November 2008) establishes in Article No 14 that the process of forest restoration will be developed under a fuelwood energy approach to guarantee a balance between the supply of wood fuel resources (firewood and charcoal) and its demand. Nevertheless, in spite of the huge social, economic and environmental importance generated by the magnitude of the fuelwood and charcoal industry, the efforts of the public institutional actors have been very limited to encourage the sustainable development and restoration of the natural resource firewood, to add value to the product (by drying, better quality, etc.) and to provide effective mechanisms for marketing and efficient use of the resource.

The Government of Nicaragua, worried about the growing demand for firewood, its low restoration capacity and inefficient use presented the National Firewood and Charcoal Strategy in order to improve their sustainable production and more efficient use. The Strategy was developed in an integrated and coordinated way by the Ministry of Energy and Mines (MEM), the National Institute of Forestry (INAFOR), the Ministry of Environment and Natural Resources (MARENA), the Ministry of Agriculture and Forestry (MAGFOR); with the collaboration of the NGO Nicaraguan Foundation for Sustainable Development (FUNDENIC SOS).

One of the most important elements of the strategy is based on the promotion of sustainable production of energy forest plantations and agro forestry systems in order to assure sufficient supply of firewood and charcoal for the national demand of households and the productive sectors, as well as for exportation. It establishes guidelines for all productive and social sectors of the population involved in the value chain and defines the visions of the forestry sector towards sustainable production and marketing of wood energy products and its efficient transformation into calorific energy. In the frameworks of the National Forestry Policy (MAGFOR - INAFOR - MARENA) and the Strategic Plan of the Energy Sector of Nicaragua 2007-2017 (MEM), it is meant to create the conditions to develop awareness raising and education programs, to motivate investments into the production, marketing and efficient consumption of firewood and charcoal and to secure the restoration of the forests. The country's firewood supply is coming from forest plantations with high value energy species and from the extraction of natural forests. The latter corresponds to 98% of the national supply. Both production processes must be regulated and controlled by INAFOR. However it is believed that only 2% of the supply is produced under these regulations.

1.3 Institutional set-up in the energy sector

The most important institutional actor in Honduras is the Institute of Forest Conservation and Development (ICF). Its objective is to develop a participatory, decentralized and efficient management of forests, protected areas and wildlife. It intends to stop the processes that are degrading the ecosystems and to encourage the investment in conservation and sustainable use of the natural resources within the current legal framework, optimizing equitable economic, social and environmental benefits for the society. ICF is a decentralized entity directly

connected to the Presidency of the Republic, which is acting with technical, administrative and financial independence as implementing body of the national politics of forest conservation and development. It has the possibility of developing programs and to create the necessary administrative, technical and operative units to pursue the objectives and targets of the Decree 98-2007. In fact ICF was created by the Decree in February 2008.

As mentioned above the most important institutional public actors in Nicaragua in the fuelwood energy sector are the Ministry of Energy and Mines (MEM), the Ministry of Environment and Natural Resources (MARENA) the Ministry of Agriculture and Forestry (MAGFOR) and the National Institute of Forestry (INAFOR).

Local governments may play an important role in some regions of both countries, whenever they include the fuelwood issue into their local political agenda.

The most important actors of the private sector are national NGOs acting as improved cookstove providers as AHDESA, PROLEÑA, MIFOGON, ONIL (of the North American NGO HELPS), or local Development NGOs as Hermandad de Honduras (HdH), the Foundation for Integrated Development of Honduras (FUNDEIH) of the President of the Honduran Congress, the Foundation of Private Development Organisations of Honduras (FOPRIDEH), the MIRADOR Project with Gold Standard Certification for their Justa stove model, and the local Development NGOs ASOFENIX, ADDAC, FADCANIC and FUNDAR in Nicaragua.

1.4 Major donor activities

During the last years, governmental and private institutions, international cooperation organisations and different NGOs have sponsored programs to create conscience of the families about the environmental and health damages generated by the use of traditional stoves. They have promoted the installation and use of improved cookstoves, which are between 40% and 50% more efficient than the traditional ones, and which therefore diminish both the consumption of firewood and the damages to the health of the population.

As mentioned above, both countries face a high consumption of firewood, which is mostly used in inefficient stoves. Due to cultural and social aspects a transition to cooking devices using LPG or electricity is not viable in most cases. For this reason the experiences of the main institutional actors and of the international cooperation organisations suggest that the problem is not rooted in the use of firewood, but in an inadequate traditional technology. The dissemination of improved cookstoves is therefore the best option, since they use a local energy source and are constructed by using locally available materials and labor. The issue has been so relevant that universities and international organisations have contributed, together with local NGOs and Universities, in the technological development of improved cookstoves with the intention of improving energy efficiency by developing diverse models that fit to the specific needs and cultures of the users.

In Honduras the most important donor organisations are the Inter American Development Bank (BID) and the World Bank with the new Program SREP and its ERUS component for fuelwood energy (about 2 million USD), USAID, engaged in improved cookstove dissemination and training programs with their Project ACCESSO, the European Commission with the Forestry Development Projects FORCUENCAS, MOSEF for the modernisation of the forestry sector and CLIFOR, the latter implemented by GIZ (formerly called PRORENA).

The Small Scale Project Fund of UNDP is active in both countries and is financing improved cookstove dissemination activities. The North American NGOs Trees Water People (TWP) and AGLIDESH are active in both countries, financing stove dissemination activities.

The System of Central American Integration (SICA) is the most important actor for regional political agenda setting. In a recent meeting in Managua SICA has declared energy efficiency in fuelwood use as a priority for the Central American countries.

The Alliance for Energy and the Environment (AEA) is financing energy projects in the Central American countries with funds from Finland, Austria and the European Commission.

The Dutch NGO HIVOS is financing the Regional Energy and Poverty Program (PREPCA), implemented by the Energy Net Foundation BUN-CA with coordination office in Costa Rica and improved cookstove activities in Nicaragua and Honduras.

In Nicaragua the Project “Establishment and Sustainable Forest Management and Marketing of Products for Energy Consumption” is implemented since 2006 by the Nicaraguan NGO FUNDENIC, financed with funds of the European Commission.

2 Planned outcome

Energy service segment	Old targets		New targets	
Energy for lighting and electric household appliances	0	people	0	people
Cooking energy for households	0	people	250,000	people
Electricity and / or cooking energy for social infrastructure	0	institutions	500	institutions
Energy for productive use / income generation	0	enterprises	500	enterprises

3 Project approach

A regional fund for the promotion of sustainable firewood use and management in both Nicaragua and Honduras will be established to promote the dissemination of improved energy efficient stoves and the sustainable utilization of wood and other biomass fuels.

A regional partner organisation with activities in both countries will be selected for the management and administration of the fund and will promote the regular calls for project proposals, to be financed by the fund. The criteria for selection of the partner organisation are: practical experience in the sector, sound administration capacities with proven international standards, low administration fees for the management of the fund and political experience in the sector in both countries.

Inter-institutional National Advisory Boards will be established in each country for defining the funding policy and strategy, and evaluate and approve the projects submitted to the fund. The National Advisory Boards will also elaborate and approve the guidelines for project application and define the criteria for project evaluation and approval. They will be composed of the most important actors of the public energy and forestry sectors, the academic sector (universities and professional training institutions) and private sector (NGOs, microfinance institutions, small and medium enterprises Dand production associations). The advisory board will also ensure that all proposals accepted are compliant with EnDev methodology.

The regional fund will build upon existing EnDev structures: the EnDev country projects will function as the Executive Secretariats of the fund in Honduras and Nicaragua. They will organise the Advisory Board Meetings and document the board decisions and project approvals. They will also be responsible for the implementation of the monitoring and evaluation of the approved projects, advise the implementing partners on technical and administrative issues and promote regional networking activities. These activities will be implemented by the EnDev country measures, but financed by the fund.

The thematic areas and eligible project activities to be financed by the fund are:

- stove market development
    - dissemination of energy efficient stoves (for households, social infrastructure and productive use)
    - implementation of stove marketing structures

    - implementation of stove financing models
- stove producer and user training
    - training activities for producers and users
    - development of after sales and maintenance services
- watershed and fuelwood plantation management
    - promotion of watershed management
    - promotion of fuelwood plantations
    - promotion of fuelwood marketing

The indicators and counting procedures for the outcomes of the activities of stove and fuelwood marketing, training and watershed / plantation management will be developed in close cooperation with EnDev and the partner organisation selected for the management of the fund, according to selected climate change indicators used by the international development community.

According to the submission of eligible project proposals to the fund in the selected countries, the time horizon for implementation of the fund will have to be extended, or other Central American countries with a similar fuelwood use problematic will have to be included.

3.1 Energy technologies and services promoted by the EnDev project

Energy efficient stoves for cooking in households and social institutions and energy efficient kilns and stoves for productive use for the production of maize tortillas, tiles, bricks, bread, pottery and other productive processes that depend on the use of firewood will be promoted.

3.2 Approach to provide clean cooking technologies to households

The provision of clean cooking technologies to households will be based on a market development approach for the dissemination of improved energy efficient stoves. Selected elements of the value chain for improved cookstoves will be specifically strengthened in order to boost the distribution of this energy efficient technology.

A network of local stove enterprises will be promoted who provide their clients with the improved technology and also offer after sales and maintenance services. They will be trained in stove construction and maintenance and will train other local technicians in the communities. According to the cultural cooking practices and preferences in the different regions of the two countries the available stove models will be selected, based on their comparative fuel efficiency (e.g. Justa, Onil, Incahuasi, or biomass gasifiers). Interested families will have to cover the cost of locally available materials and the fund will contribute to financing materials which are not readily available locally such as plates, chimneys and the rocket ceramics. However local providers of these materials will be promoted where feasible. Participating villages should receive assistance of a local organisation (NGO, local government) for organisational, logistical, training and backstopping purposes. Installation of the improved cookstoves and training of the households will be done by private organisations active in the field for many years and with specialized skills and experiences (AHDESA, PROLEÑA, MIFOGON, etc.) Households are expected to contribute to the cost of the new stoves with at least a 50% share by allocating cash or locally available materials and labour. In urban and peri urban areas, where people have to buy fuelwood, the feasibility of distributing biomass gasification stoves and replacement of firewood by saw dust and other available biomass waste materials will be promoted.

Accompanying activities in watershed management and fuelwood production and marketing will be promoted and implemented by the fund where feasible. In each country up to 25,000 stoves will be promoted by the fund to benefit approximately 125,000 people.

3.3 Approach to provide access to modern energy services for social institutions

Where school meals are promoted by the World Food Programme, as is the case in Honduras, energy efficient stoves for social infrastructure will be implemented by promoting the "Tortillero" stove based on the "Justa" model. At least 500 stoves for 500 schools will be promoted by the fund in Honduras.

3.4 Approach to provide access to modern energy services to SME's

As fuelwood consumption is larger and the resulting environmental problems are generally more severe in productive processes that rely on fuelwood for energy than it is on household level, the fund will promote improved energy efficient kilns and stoves for productive use as for the production of maize tortillas, tiles, bricks, bread baking, brown sugar production and indigenous pottery. At least 500 stoves or kilns for productive use will be promoted by the fund.

4 Expected impacts of the project intervention

Impact	Possible indicators
Environment	Improved sustainable use of fuelwood resources by reducing fuelwood consumption of households and productive processes
Health	Improved health and safety conditions for households by preventing in house air pollution and fires
Poverty / livelihood	Improved living conditions of households and income possibilities of small and medium enterprises
Education	Improved technological and practical knowledge by training, networking and exchange of experiences
Governance	Improved governance by strengthening local structures and actors in the sustainable use of watersheds and forest areas

5 Budget

	EUR
1 Human resources and travelling	280,000
2 Equipment and supplies	0
3 Funding financing agreements / local subsidies	2,500,000
4 Other direct costs	12,317
5 Total direct costs	2,792,317
6 Mark up costs / administrative overheads / imputed profit	207,683
7 Cost price	3,000,000

Madagascar

Project phase	12 / 2012 – 03 / 2014					
Project budget	EUR 300,000					
Target groups	Firewood and charcoal using households in rural, peri-urban and urban areas of Madagascar					
Expected outcome at project end					old target	new target
Number of people	Energy for lighting and electric household appliances					
	Cooking energy for households					47,500
Number of institutions or enterprises	Electricity and / or cooking energy for social infrastructure					
	Energy for productive use / income generation					
Promoted technology	[ ] Solar	[ ] Biogas	[×] Stoves	[ ] MHP	[ ] Grid	[ ] Other
Summary of key interventions and outputs	Key Intervention 1: Enhancing production capacities of OLI stoves (firewood / charcoal) • Increase and diversify production capacities of essential parts of the stoves • Increase productivity and number of assembly lines for the OLI-stoves Key Intervention 2: Creating outlets and sustainable marketing structures in new areas of Madagascar • Establishment of permanent sales outlets • Create promotion materials and campaigns for the OLI stoves					
Coordination with other programmes	International and local NGOs and community based organisations: ASE – Association pour le sauvegarde de l'environnement ASDDG – Action Sud Développement Durable Genève ANGAP – Madagascar National Parks Tany Meva, Madagascan development organisation HELVETAS Swiss Intercooperation Madagascar Vozama WWF Madagascar					
Lead political partner	In the absence of a functioning government structure, the project works mainly with local leaders and community structures.					
Implementing Organisation	The locally operating Swiss NGO for the development of solar energy "Association pour le Développement de l'Energie Solaire (ADES)" in cooperation with GIZ Madagascar					
Implementing partners	Stove producers, private sector, ADES extension staff					
Project manager	Name: Marco Hüls			Mail: marco.huels@giz.de		

1 Situation analysis

1.1 Energy situation

Electricity

There is no 'national grid', but over 100 smaller power operators. Major grids service the three main urban areas. According to latest IEA figures, only 19% of the population are connected to a grid-based electricity supply. The rate drops to less than 6% in rural areas. Production as a whole is unable to satisfy demand, which slows down electrification efforts. Whilst reliability and coverage of electricity have increased over the past 5 years, electricity generation only covers 15% of national needs.[30]

Installed generation capacity is believed to be under 360 MW, consisting of conventional thermal power derived from costly imported fuel and increasingly also renewable energies, mostly hydro-power and, as of late, also wind. All equipment for transmission is administered by JIRAMA, the national utility.

With the current hostile climate for foreign investment due to political instability, there is not much hope for a change of the situation in the near future.

Cooking energy

Over 95% of the estimated 20 million people living on the island of Madagascar use solid biomass fuels for their daily cooking, out of which 82% use firewood and 17% use charcoal. Firewood and charcoal as major cooking fuels have become expensive, adding a big cost burden to the poor population of Madagascar.

Only 0.1% use kerosene for cooking, while 85% depend on it for lighting. The refinery in Tamatave closed in 2005, since then all fossil fuels are imported as refined products. There are no government subsidies for fossil fuels. The end-user prices are high and fossil fuels remain mostly unaffordable for the poor population with an average income of less than 1 Euro per day. Local production of liquid biofuels such as ethanol has recently been tried out, but these fuels get rather exported than used for domestic consumption.

Baseline technologies for charcoal are various simple unimproved metal stoves. Firewood is mainly used in open three-stone-fires or metal tripods. Therefore there is a potential to introduce efficient, convenient and affordable portable stoves for both types of fuel, firewood and charcoal. Deaths attributed to household air pollution caused by solid cooking fuels are estimated to be 12,700 per year, thus outnumbering the cumulative toll of 10,100 attributed to malaria, tuberculosis and HIV / AIDS. [31]Charcoal in Madagascar is mostly unsustainably produced from live trees and even firewood is unsustainably collected, especially in the arid regions in the South and West of the island. Thus, 200.000 hectares of forests disappear every year in Madagascar, mainly due to de-forestation for cooking fuel and charcoaling, agricultural expansion or exploitations for exotic timber. Madagascar as the fourth largest island on the planet has (or had) remarkable biodiversity: over 12.000 plant species grow on the island, out of which 80% are endemic species, not to be found anywhere else on Earth. Yet, this unique flora and fauna is threatened by the fast rate of forest cover loss and the subsequent erosion and impact on climate change. Without major immediate interventions most of the World Heritage will soon be irreversibly damaged and more species extinct.

The GDP is a mere 270 Euro per capita. It is estimated that without the over-exploitation of the natural resources, the GDP could by higher. Forest and soil degradation are considered main contributors to losses in national productivity.

Madagascar had a negative annual growth rate of the Gross Domestic Product during the last 30 years (-1.6% between 1975 and 2005). Madagascar is ranked 143rd out of 177 countries classified according to the Human Development Index. Almost 70% of the population

[30] http://www Source.reegle.info/countries/madagascar-energy-profile/MG
[31] Source http://www.cleancookstoves.org/countries/africa/madagascar.html

live below the poverty line. This is especially true for 80% rural areas, where living conditions have been steadily declining in recent years (in terms of transport, health, education and market access).

Household sizes vary considerably between the regions. The national average is estimated to be between 5 and 5.5, depending on the source.

1.2 Policy framework, laws and regulations

In 2008, given the dependency on the oil imports and in line with a long term development strategy for the country, the Government of Madagascar set ambitious targets for extending electricity access. These are laid out in the Madagascar Action Plan (MAP), which serves as the Madagascan Poverty Reduction Strategy Paper (PRSP). The MAP covers the period 2007-2012, and provides the medium term framework for achieving the country's long term development aspirations as embodied in Madagascar Vision Naturally, as well as the long term targets in the Millennium Development Goals (MDGs). In the targets, the Government of Madagascar has planned to increase the electricity access rate to 74% in urban environment and 10% in rural environment by the year 2011. The energy supply should have been derived from all possible sources of energy in Madagascar (solar, hydro, wind, biomass).

To reach those targets, the Government of Madagascar elaborated the National Energy Strategy and Policy, touching on issues such as energy pricing and subsidies, energy sector governance and regulation, and the financing of energy sector investments. The policy also contains a separate policy statement on the electricity sub-sector, which confirms the policy commitment to enhancing access to electricity, particularly in rural areas. The National Energy Strategy sets out how the energy transition in Madagascar will be achieved, given the macroeconomic impacts of consuming more petroleum products and electricity. The strategy highlights that the Government's priorities to develop a knowledge-based economy and exploit indigenous energy resources will help to ensure that modern energy consumption is consistent with sustainable increases in national income levels.[32]

Yet, the last three years were difficult times for Madagascar. The political crisis started in early 2009, leaving Madagascar with an internationally not recognized government. As a consequence of the political unrest, many international organisations stopped their activities and donors ceased all non-humanitarian aid. The country has been suspended from regional bodies and the international community will only recognize Madagascar's government after fresh polls, not expected to take place before May 2013. Only regional bodies like the AU and SADC were still trying to find solutions.

In addition to the political crisis, the already bad economic situation was aggravated by the global economic crisis. Moreover, severe droughts in 2009 hit the most vulnerable arid South and West of Madagascar. Local staple food production in Southwest Madagascar significantly declined and thus food prices drastically increased. Food-riots added to the political instability.

Due to the seriously challenged political situation, there is no governmental enforcement potential; any existing laws and regulations are currently not enforced. The only valid guiding principles seem to be the parts of the Madagascar Action Plans (MAP) to protect the fast dwindling natural resources and protect the endemic fauna in danger of extinction. This is mostly due to pressure by international conservation movements.

The current Madagascan government takes those ecological elements of the MAP serious and tries to assist other organisations in the promotion of energy efficient biomass applianc-es like cook-stoves to reduce the quantity of solid biomass required for preparing a meal.

1.3 Institutional set-up in the energy sector

The Ministry of Energy and Mines (MEM), has jurisdiction over the energy sector, including the power sector and mineral resources. The original Ministry of Energy (MOE), which was

[32] Source http://www.cleancookstoves.org/countries/africa/madagascar.html

separate from the MEM, had some jurisdiction over the energy sector since January 2007, but the ministries are now in the process of integrating. The MEM takes charge of the investment and the development strategy policy, including requests for foreign assistance and other policy aspects, whilst the utility JIRAMA is in charge of the technical aspects of the power sector.

The powers of the Office de Régulation de l'électricité (ORE) are defined by the Electricity Code and the Decree 2003-194. The ORE is responsible for granting permits and concessions to suppliers (from Madagascar and abroad).

The 'Office Malgache des Hydrocarbures OMH' (Malagasy Hydrocarbons Board) is the regulatory authority for the downstream petroleum sector, and issues authorisations to operators for the import, processing, transport, storage and sale of hydrocarbons; these activities are open to Malagasy nationals and foreigners. The exercise of such activities requires an operating licence and the payment of certain costs.

The regulatory body is, in theory, wholly independent from the government. Permit holders in the electricity sector must pay a levy of 1.2% on their turnover, and the sums collected are used to fund the ORE.

The country has not enacted any legislation specifically to promote and enable the development of renewable energy projects. The creation of a regulatory framework for renewable energies would promote the utilisation of such energy sources in the country, as well as facilitate and improve currently-operational projects and planned projects.[33]

However, until a new government will be established, the government institutions will continue to be virtually dysfunctional. Thus there is basically no functional institutional framework in the energy sector. Exploitation of natural resources is completely uncontrolled.

The only significant ongoing activities take place in the NGO sector, though with dwindling support due to the withdrawal of most donor funding. Private donations have also taken a dent with the global economic crisis. Thus the situation is grim.

1.4 Major donor activities

Due to the outstanding biodiversity of Madagascar, most donor activities target the conservation aspects and climate change resilience of the island. In the past years several attempts were made to implement stove projects in Madagascar, mostly concentrating on the North and the East of the island, where the major National Parks are. Yet, in those areas higher rainfalls favour re-growth of biomass resources and fuel scarcity is not as acute as in the South-western parts of the island. As the fuel scarcity is not perceived such a problem, cook-stove uptake was slow. Yet, hardly any efforts were made in the South and West which are arid regions and thus much more vulnerable to the impacts of climate change and dwindling natural resources, as annual increments of biomass are not comparable with the humid East. World Wildlife Fund (WWF) was one of the few organisations active in the Southern part of the island with the dissemination of fixed mud-stoves for firewood in rural areas.

GIZ also had a cook-stove component within the programme for Sustainable Management of Natural Resources in Toliara. In 2008 it scrutinized several existing and imported stove models on the island for fuel efficiency to identify appropriate models for dissemination. For firewood it found the WWF-promoted fixed mud-stoves to be the most fuel-efficient, but they were economically not viable in the sparsely populated rural areas. In the charcoal stove sector, the models with the ceramic liners produced in the highlands of Madagascar were efficient, but in the arid region around Toliara no suitable clay was found for the production of the ceramic inserts.

The Swiss NGO 'Association pour le Développement de l'Energie Solaire' (ADES) although still small, is one of the major players in the cook-stove sector in the South and West. In 2001 ADES was founded to produce solar- cookers in Toliara. The reason was that solar cookers

[33] http://www.reegle.info/countries/madagascar-energy-profile/MG#regulatory_barriers

do not rely on biomass fuels and do not emit greenhouse gases. Although the arid climatic conditions in that region with abundant sunshine and a rainy period not exceeding 6 weeks are unusually favourable for solar cooking, ADES soon realised the need to complement the solar cookers with fuel efficient biomass-powered stoves. People also need to cook when there is no sun.

In 2009, in the absence of suitable existing stove models, ADES and GIZ joined hands to develop locally produced efficient stoves for firewood and charcoal. In 2010 the GIZ programme closed after the political turmoil peaked and most donor support was withdrawn. On its own, ADES continued the development of a range of stove models for firewood and for charcoal.

ADES has become one of the more reliable actors in this aspect of natural resource conservation and has established good relations with authorities on local, regional and national level. Especially on the local and regional level, the leaders and authorities are very supportive of the initiatives of ADES.

In the difficult times of the past years, ADES continued stove production and promotion in Madagascar. Despite all the challenges ADES has managed to grow and expand its operations in the stove sector, for which it gets increasing international recognition. ADES has been awarded several prizes for its work[34].

Currently no major donor funded activities are taking place in the cooking energy sector, due to the withdrawal of most donor support. ADES is one of the few remaining players that has prevailed, as it works independent from the national government structures and is not reliant on donor funding, with most of its revenue coming from private donations in Switzerland. To date there are no other programmes known to be supporting the local production of quality improved cook-stoves in Madagascar.

2 Planned outcome

Energy service segment	Old targets		New targets	
Energy for lighting and electric household appliances	0	people	0	people
Cooking energy for households	0	people	47,500	people
Electricity and / or cooking energy for social infrastructure	0	institutions	0	institutions
Energy for productive use / income generation	0	enterprises	0	enterprises

3 Project approach

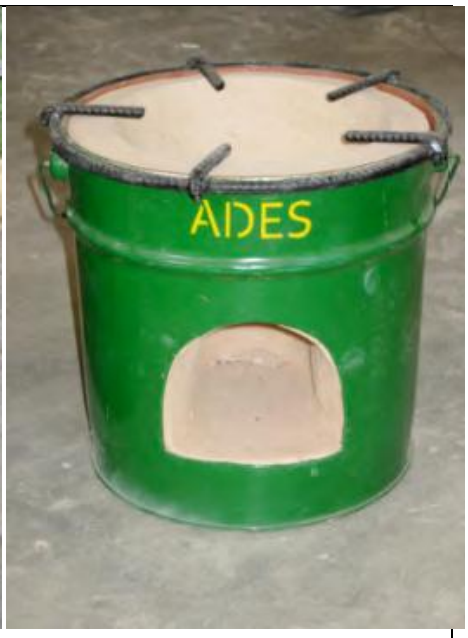
3.1 Energy technologies and services promoted by the EnDev project

Technologies to be promoted

The focus will be on the **countrywide production, promotion and marketing** of the range of efficient firewood and charcoal stoves developed by ADES with initial technical support by GIZ. The stoves are locally produced by private workshops and contain locally produced custom-made fired ceramic inserts to optimise fuel efficiency. They are sold under the brand-name **OLI.**

[34] e.g. Brandenberger prize (2010), Doron prize (2008), National and the International 'Trophée des femmes' Prize from the Yves Rocher Foundation (2007), Swiss solar prize (2007)

The OLI-b range for firewood, from left to right: up to pot No. 36, up to pot No. 45, and up to pot No 60



The smallest OLI-c for charcoal.

The firewood stoves **OLI-b** (the 'b' stands for 'bois', the French word for firewood) are based on the rocket-stove principle and feature a locally produced top-plate out of cast aluminium. The stoves use 46-68% less firewood than the traditional open fires with three stones or a metal tripod. The OLI-b range represents currently the most affordable and popular portable household-size firewood stoves in the country. The smaller stoves perform equally well as their imported 'brothers', but they have comparative advantages concerning price and after-sales services.

The savings of the **OLI-c** for charcoal depend on the type of baseline stove it replaces, but savings are reported to exceed 40% on average.

Both models are available in three different sizes to cater for the needs of various family sizes. The larger models can also be used in small restaurants and / or school kitchens. They vary in firepower and are suited for the various pot sizes manufactured in Madagascar. Most pots are cast aluminium pots with standard sizes, numbered according to their size. The stove with the firepower of 1.5 kW is suitable up to pot No 36, for normal household sizes up to eight members. The model with 3.7 kW accommodates pots up to No. 45, for larger families with more than 8 members and food vendors. Upon demand by schools and the World Food Programme, a new model is currently under development with a firepower of 12.1 kW for the largest pot No 60, mostly for small restaurants and schools.

ADES supports local production of the components and assembly of the finished stoves at private workshops. The ceramic parts are custom made for ADES currently in only one workshop in Fianarantsoa. The aluminium pots of the firewood stove are cast by one cook pot manufacturer near the capital Antanarivo. The lifespan of the stoves is estimated to be between three and five years. ADES gives a three year warranty during which it provides free repair services for those damages that fall under the warranty.

Initially ADES sold the stoves preferably to be used in combination with the solar stoves, but the independent demand for biomass stoves is overwhelming. The development of a sustainable market for the efficient biomass stoves is sought to be stimulated with the support of the EnDev funding. No subsidies are envisaged for the sales of the OLI-stoves to ensure sustainability along the supply chain in the future.

Geographical coverage: From the South-West up to the north of Madagascar

Six renewable energy centres have been built since ADES started its work in 2001. The first was opened in Toliara in 2004. It became a showcase for renewable energies, comprising solar water heating, electricity generation through photovoltaic installation and a wind mill. Solar PV is also applied for the fresh-water supply from the well in the courtyard through solar pumps. In 2007, the centre was expanded to accommodate additional offices and a large training room.

In 2006 a second centre was opened in Ejeda, a regional market town attracting visitors from remote villages. As there is no public electricity supply, ADES built its own installation, powered by solar energy. Recently, a tree nursery with a botanical garden created an attractive green oasis in the otherwise arid area.

In May of 2008, ADES added a third centre right in the middle of Morondava, which is located some 300 km North of Toliara. The new manager is a former teacher with good public relations. As a result, ADES is already well established in this location.

Not even the political instability or the severe drought could stop ADES from opening a fourth centre in Morombe in October 2010. Notwithstanding current problems with rice production, the region has significant potential provided that the irrigation facilities are maintained. In November 2011 the fifth centre was opened in Mahajanga, the “flower town” in the northwest of Madagascar. The urban area of Mahajanga is the second largest charcoal consumer on the island. Recently ADES established a small sales-point for stoves in the capital Antanarivo. The official inauguration is planned for 2013.

Production expansion

In July 2011 ADES opened in cooperation with the local company BERMA the new production site of ceramic combustion chambers in Fianarantsoa. BERMA expanded from a two person-workshop to a factory with 35 employees. Today BERMA is able to produce up to 1,500 combustion-chambers for the OLI-stoves per month.

Additionally, ADES opened in May 2012 a big metal factory to produce the metal cladding of the OLI stoves. Previously the metal parts were buckets donated in Switzerland and imported into the country. This dependency from imports was identified to be a bottle-neck to scale up production and should be eliminated by local production from galvanised sheet-metal in the near future.

Up to date, 19,000 energy saving cookers have been sold (mix of all technologies).In regions where ADES is active, the name ADES is widely recognised in the population. ADES is an accepted and sought-after partner for cooking energy solutions at a national level.

3.2 Approach to provide electricity to households

Not relevant for this proposal

3.3 Approach to provide clean cooking technologies to households

So far ADES had the goal to enable the largest part of the population of south and southwest Madagascar to have access to solar cookers and / or the very effective OLI-stoves. With the EnDev funding, efforts will be expanded to create a supply of energy-efficient cook-stoves in the whole country.

At present, the demand for the biomass-powered OLI-stoves already exceeds the current production capacity. Due to the global economic crisis, the private donations towards ADES have decreased in the last two years. This has lead to the situation that ADES has built up all the infrastructure for the sales outlets, created all the awareness and raised the interest in the OLI-stoves and now lacks the funding basis to enhance the production capacity out of own means. Therefore the EnDev contribution will be used in the first place to enhance the production capacity of the stoves. This will be vital to capitalise on the already created sales structures, which can’t expand unless they get more product to sell.

Key Intervention 1: Enhancing production capacities of OLI-stoves

In order to ease the current bottlenecks of production of essential parts of the OLI-stoves, additional production sites are envisaged for the ceramic inserts (currently only one production site at BERMA) and the aluminium pot-rest plates for the firewood stoves (also only one site). At least one more site should be operational for each of the parts, wherever opportunities arise. Otherwise scaling up of the current OLI-stove production will be more challenging.

At least one additional Ceramic production site will be established. The site selection will depend on the availability of suitable clay and already existing skills of potential producers, plus the adequate mindset of a potential business partner. The aim is to have a viable business that can provide good quality inserts for both the firewood and the charcoal stove. Ideally a site will be in a geographically different area to spread out the production and reduce transport costs to the assembly site of the stoves. Otherwise a second production centre will be established in Fianarantsoa, where most of the commercial ceramic production of the country takes place.

At least one additional aluminium casting facility produces metal pot-rest plates will be established. The cast-aluminium pot-rest plate is a crucial element of the firewood stove, as it is the interface between the combustion chamber and the pot. Its design has significant impact on the efficiency of the heat transfer into the pot. It is therefore paramount to have a good quality durable interface in the correct dimensions. Any producer who currently makes the cast aluminium cook pots used in Madagascar, can also make these plates. Currently there is only one producer trained. The aim is to have at least one more producer to deliver this stove-part to the assembly lines of the OLI-stoves.

In addition to the new production facilities for crucial parts, the EnDev supported project aims to increase productivity and number of assembly lines for the OLI-stoves.

Currently the OLI-stoves are assembled in 6 centres in the Western and Southern part of Madagascar. Previously the metal cladding was provided from industrially made buckets imported from Italy, into which the ceramic combustion chambers were fitted in Madagascar. The dependence on imported stove-parts poses a bottleneck in the scaling up of the production of the stoves. It is also not sustainable to rely on imported items. Therefore the current assembly lines need to be equipped with tools to cut the doors, roll and make seems for the stove body. There are relatively simple standard tools that can be operated without electricity. On the long run, each workshop will need to be equipped with all the necessary tools to make claddings from locally purchased galvanised sheet metal. The necessary tools will be need to be imported, as they are not available in-country. For a start, the existing metal workshop in Toliara will be equipped with a set of tools to start producing the metal cladding. The finished cladding will then be sent from Toliara to the other assembly points of the OLI-stoves. The staff in Toliara will need to be trained on the production of the cladding and how to operate the machines and tools. The expansion of metal production to other assembly lines will depend on the experiences from Toliara.With the aim to service other regions of the country, especially the capital, new assembly workshops need to be established closer to the potential markets. These workshops should be attached to centres, which can also provide user training and be a stove hub for retailers.

Key Intervention 2: Creating outlets and sustainable marketing structures in the major urban and peri-urban areas of Madagascar

Currently retailing of stoves is done by the workshops and production centres of the stoves. It is envisaged to create a network of permanent outlets of stoves closer to the end-user. These outlets will be operated by independent retailers, creating new job opportunities especially for enterprising young people. The creation of permanent outlets in the densely populated areas will increase the visibility of the stoves and make it easier for the potential customers to actually buy a stove. The operators of the outlets can furthermore do their own promotion and employ vendors, who can penetrate further into the townships. This is expected to boost the sales figures of the stoves and ultimately create sustainable marketing structures for on-

going sales. Those outlets will also be in charge to entertain warranty claims and provide after-sales services to the customers.

For EnDev the plan is to target especially the capital Antanarivo. ADES has already rented a small office, but is not actively promoting the stoves yet, as the current production capacity is not able to satisfy the demand. Once the production capacity is increased with EnDev funding the sales in Antanarivo are expected to soar. This expectation is based on the experience from the 'environment day' in Antanarivo, where the ADES promoters went with a stock of 100 OLI-stoves, which were sold out on the first day. In two days 500 more OLI-stoves were ordered and a waiting-list had to be created.

ADES already follows a number of different routes to increase the awareness of their stoves. Cooking demonstrations and advertisements on radio or television and in the press are some of the routes chosen. Another route is the encouragement of schools, missions, hospitals, homes etc. to include solar and energy efficient cooking in their education programs. Successful strategic cooperation agreements have already been established with several environmental organisations, others will be added.

At present the created demand can hardly be satisfied by the existing production. Unless the production capacity is enhanced, ADES will not increase awareness raising activities, in order not to disappoint potential customers.In line with the expansion of production capacity, all six centres of ADES shall expand and professionalise sales structures including quality control, branding and after-sales-services.

To market the 'brand' of the OLI-stoves, several types of promotion materials should be created. This can be caps, T-shirts, umbrellas, printed media like leaflets, calendars etc. that can be distributed through the permanent outlets and support the brand-identification of the OLI-stoves.

To increase awareness of the stoves and the permanent outlets, promotion campaigns can be targeted at different market segments: via radio, press and TV in the more urban areas and via awareness creating cooking demonstrations in communities and schools, hospitals etc. This is partially already done, but it should be intensified especially around newly created sales points.

The combination of all the key interventions is estimated to to reach nearly 50,000 people with OLI-stoves up to mid 2014.

ADES will continue to promote the production and use of solar cookers, but this will be done with own funding from private donors and carbon finance, as each solar cooker proves to reduce 2.5 tonnes of CO_2 emissions per year. The finances from EnDev will be kept separately and strictly used for the expansion of production capacities and the promotion of biomass stoves. No EnDev funds will be used for end-user subsidies or the generation of carbon credits.

3.4 Approach to provide access to modern energy services for social institutions

Not relevant for this proposal

3.5 Approach to provide access to modern energy services to SME's

Not relevant for this proposal

4 Expected impacts of the project intervention

Impact	Possible indicators
Environment	Reduced overall demand of biomass energy, potentially 1 ton of primary wood saved per stove (equivalent to 3,000 square meters of woodland): number of stoves sold to households (stove sales records)

Health	Reduction of smoke and heat exposure for stove users: percentage of households that perceive a reduction in health problems caused by the use of fuels in inefficient systems for cooking (user survey)
Poverty / livelihood	For the users more money available at cause of lower expenses for fuel, new jobs and more income for producers and vendors along the stove marketing chain: savings on monthly fuel expenditure (user survey); stove producers, transporters of stoves and retailers perceive a rise in their income and improvements in their livelihoods (survey)
Education	ADES helps to develop a programme with local schools encompassing environmentally friendly behaviour and healthy nutrition. The Ministry of Education issued a related ordinance in 2007 and ADES acts as a partner on the local level in its realisation: number of schools taking up stoves for school meals (survey among schools); number of schools including energy saving cooking and / or environmentally sensitive behaviour in the curriculum (survey among schools)
Governance	see remarks on political situation

5 Budget

5.1 GIZ budget

	EUR
1 Human resources and travelling	0
2 Equipment and supplies	0
3 Funding financing agreements / local subsidies	250,000[35]
4 Other direct costs	28,968
5 Total direct costs	278,968
6 Mark up costs / administrative overheads / imputed profit	21.032
7 Cost price	300,000

5.2 ADES budget

	EUR
1 Human resources and travelling	45,000
2 Equipment and supplies	150,000
3 Infrastructure / vehicle	30,000
4 Administrative overheads of the NGO	25,000
5 Total direct costs	250,000

[35] See 5.2.

Malawi

Project phase	12.2012 – 03.2014					
Project budget	EUR 250,000					
Target groups	Urban and peri-urban firewood using households					
Expected outcome at project end					old target	new target
Number of people	Energy for lighting and electric household appliances					
	Cooking energy for households					62,500
Number of institutions or enterprises	Electricity and / or cooking energy for social infrastructure					
	Energy for productive use / income generation					
Promoted technology	[ ] Solar	[ ] Biogas	[×] Stoves	[ ] MHP	[ ] Grid	[ ] Other
Summary of key interventions and outputs	Key Intervention 1: Enhancing the capacities of craftsmen producing the energy efficient cookstove "Chitetezo Mbaulas" established by EnDev-ProBEC and promoting transportation of stoves to urban areas. Key Intervention 2: Facilitating a distribution system to new markets in urban areas by creating outlets and sustainable sales structures for fuel-saving firewood stoves in the major urban and peri-urban areas of Malawi					
Coordination with other programmes	DISCOVER programme (UKaid, IrishAid and Norway funded), IRTICP (Irish Aid funded), Balaka Sustainable Energy Programme (EU funded), COOPI (EU funded)					
Lead political partner	Ministry of Environment and Climate Change Management					
Implementing Organisation	The local Non Profit Organisation "Area 55 consulting" in cooperation with GIZ Malawi					
Implementing partners	Stove producers, private sector (PR and marketing specialist)					
Project manager	Name: Marco Hüls			Mail: marco.huels@giz.de		

1 Situation analysis

1.1 Energy situation

Over 90% of the overall energy consumption of Malawi is provided by solid biomass fuels – 87% using firewood and 8% charcoal to satisfy their thermal energy needs. Less than 7% of the 14 million people are connected to the national grid. The connected demand far exceeds the supply of 320 MW installed generation capacity.

Thus, load shedding is frequent and less than 3% of the population count on electricity for cooking. Gas is only intermittently available and considered to be expensive. Fossil fuels have been in short supply in recent years due to import difficulties. Therefore firewood and charcoal are the major cooking fuels, even in the urban areas.

Most of the charcoal is consumed in urban areas – representing 46% of total urban demand. Unlike in many neighbouring countries, firewood is still available in all four major cities of Malawi (Lilongwe, Blantyre, Zomba and Mzuzu) as well as in the district capitals. Firewood provides over 50% of the urban cooking fuel and nearly 100% in the rural areas.

Firewood is mainly used in open three-stone-fires, so there is a potential to introduce convenient affordable portable firewood stoves in urban areas and shift eventually some parts of the cooking activities currently done with charcoal to a less primary-energy intensive fuel source, meaning uncarbonised firewood.

Charcoal in Malawi is mostly unsustainably produced from live trees: over 60% of the charcoal is made from wood originating from protected Forest Reserves and National Parks; even firewood is unsustainably collected.

One of the poorest countries in the world, it is estimated that Malawi's GDP would be 5.3% higher if it were not for such unsustainable use of natural resources[36]. Forest and soil degradation are considered some of the main contributors to these losses and it is estimated that Malawi's forests continue to decline by 1% per year. This means that charcoal will be produced increasingly further away from the cities, and households must spend more for their cooking fuel. There is a rising tendency to import charcoal from the neighbouring countries Mozambique, Zambia and Tanzania, leading to severe impacts in these countries.

The Maplecroft's Climate Change and Environment Risk Atlas shows that Malawi is increasingly vulnerable to the impacts of Climate Change. According to the new Climate Change Vulnerability Index (CCVI) there are 30 countries at ‚extreme risk' worldwide. Malawi moved fast from position 15 in 2011 up to number 9 on this list. [37]

This explains why the newly formed Ministry of Environment and Climate Change Management is supporting the initiative to promote energy efficient biomass appliances like cookstoves to reduce the quantity of solid biomass required for preparing a meal.

In addition to the environmental and financial costs, the use of solid biomass for cooking in the traditional setting – smoky, inefficient open fires in poorly ventilated kitchens – has severely negative impact on human health, the greatest threat being respiratory infections stemming from household air pollution. Pneumonia in children under 5 years is also fairly common though difficult to identify in Malawi. Improved cookstoves can reduce the smoke emitted during the cooking process, provided that dry wood is used.

Several successful stove projects have already been executed in Malawi, such as those supported by Energising Development (EnDev) through the Programme for Basic Energy and Conservation in Southern Africa (ProBEC) from 2005-2008. However, the lion's share of work in the cookstoves sector has and is been targeted at rural areas.

[36] The Malawi State of Environment and Outlook Report 2010, Ministry of Natural Resources, Energy and Environment
[37] http://maplecroft.com/about/news/ccvi_2012.html and http://maplecroft.com/about/news/ccvi.html

According to the 2008 census, urban dwellers represent at least 15% of Malawi's total population, equalling roughly 2.1 million people in over 477,000 households at an average of 4.4 members per household.[38]

Urban dwellers are the biggest consumers of non-collected biomass. However, the capacity to produce a sufficient quantity of good quality improved cookstoves is still limited in the urban areas. Therefore, support is urgently needed to enhance stove production and link stove producers with distribution and sales structures in the urban areas. This will encourage urban and rural stove producers to grow their businesses and once started, continuing to invest own resources in building up the urban demand for their stoves – building on the successes of EnDev and ProBEC. As there is currently no other donor-supported intervention in urban areas, there is no risk of these stoves being double counted in this green market.

1.2 Policy framework, laws and regulations

Malawi's Forestry Policy (1996) Section 2.3.11.2 calls for the development, adaptation and promotion of woodfuel saving devices.

The Malawi Energy Policy (2003) Part IV (Energy Demand Sectors) Section 4.2.1 (Urban Household Energy Demand) outlines what the Government of Malawi considers to be the most relevant challenges to the energy sector: "…dependency on biomass from unsustainable sources; … reliance on end-use devices with low energy efficiency; … adverse impacts of the urban household energy mix on the environment and on health and safety." The policy document indicates Government's interest in devising "promotional strategies aimed at expanding the use of improved ceramic firewood stoves in poor urban households" and "reducing the proportion of households using three stone cookstoves to 50% by 2020."

Malawi's Growth and Development Strategy (2006-2011) Section 5.1.1.6 (Conservation of the natural resource base) speaks to the long-term goal of reducing environmental degradation, and the expectation to "ensure sustainable use and management of forestry resources" in the medium-term. It also mentions Malawi's high rate of deforestation and how this accelerates soil erosion and erodes natural resource-based livelihoods – attributing it to a high dependence on wood as a source of household energy (among other factors).

National Policy on Acute Respiratory Infections Control in Malawi 2nd Edition (2007) in Section 2.6 has as an objective "to advocate for well ventilated cooking areas and dwelling houses" as a means of achieving their vision for the Acute Respiratory Infection Programme to keep all children free from the burden of acute respiratory infections.

It also refers to the promotion of cleaner energy and lighting sources at household level in Section 5 (Information, Education, Communication, Advocacy and Social Mobilization).

The Malawi Biomass Energy Strategy published in 2009 says "For a long time the national policy has been to transform the country's economy from high dependency on biomass energy towards greater reliance on other energy sources, particularly electricity, but the Government of Malawi (GoM) has recently recognised that a more pragmatic approach to the biomass energy sector is required at the same time… The BEST objective was to develop a rational and implementable approach to the management of Malawi's biomass energy sector through a combination of measures designed to improve the sustainability of biomass energy supply, raise end-user efficiencies and promote appropriate alternatives."

However, to date, this Strategy has not been ratified by the Government of Malawi.

It is worth noting that Government of Malawi has recently demonstrated its commitment to environmental management by establishing an independent Ministry of Environment and Climate Change Management in early 2012. This ministry emerged from the Department of Environmental Affairs, which was previously under the Ministry of Natural Resources, Energy and Environment umbrella. The Ministry of Environment and Climate Change is a strong supporter of the proposal presented.

[38] National Statistics Office Zomba: Malawi Demographic and Health Survey 2010, p. 9 ff

1.3 Institutional set-up in the energy sector

Although the Forestry Policy foresees the promotion of energy saving devices, the Department of Forestry is more concerned with growing biomass fuel and has not been much involved in the promotion of energy saving devices. This was left to the Department of Energy, and to a lesser extent to the Ministry of Gender.

Partially as a result of the previous lobby-work by EnDev-ProBEC for improved cookstoves, there are at present a significant (and growing) number of organisations and institutions recognising the importance of solid biomass energy for Malawi. It becomes finally acceptable to acknowledge that biomass is the most common and readily available source of household energy in both rural and urban Malawi and will continue to be in the short and mid-term. There is growing consensus that it would be beneficial for all to promote the efficient use of the available resources, rather than banning their use.

Such organisations are involved in varied activities which include – but are not limited to – the following activities:

- Tree planting;
- Production of biomass briquettes;
- Production of portable and fixed wood-saving clay, brick, mud and metal stoves;
- Promotion of wood saving stoves; and
- Training in the production and use of wood saving stoves.

In March 2012 a 'Stove Camp' sponsored by Developing Innovative Solutions with Communities to Overcome Vulnerability through Enhanced Resilience (DISCOVER) Project, with support from the Partnership for Clean Indoor Air (PCIA) in Lilongwe, Malawi, brought together many of the stakeholders in this and related sectors such as health and gender. In addition to independent consultants, twenty-one organisations participated in the camp and open day.[39]

The final day of the stove camp saw the signing on to the Global Alliance for Clean Cookstoves (GACC) by representatives of various organisations and the launch of MBAULA – Movement for Bio-energy Advocacy, Utilization, Learning and Action – a network for producers, implementers and stakeholders in improved biomass cookstoves in Malawi.[40]

Following the event and with special encouragement by the Ambassadors of Ireland and the USA, the Malawi Government has recently signed up as a national implementation partner with the GACC.

1.4 Major donor activities

The regional SADC- ProBEC programme was implemented in Malawi as a pilot from 1998-2003 in two regions in Malawi namely Mulanje District and in the Borderzone of the Nyika and Vwaza National Parks. Those days, it was the only significant programme promoting efficient cooking energy solutions in the country.

In 2004 ProBEC got additional support by DGIS to scale up activities on a national level Malawi, contributing to the creation of the global programme Energising Development. EnDev-ProBEC was developing and mainstreaming energy efficient technologies in Malawi from 2005 up to May 2008. In the course of the years, many development organisations implementing various programmes on health, nutrition, environment, natural resources, food security etc. got encouraged and trained to integrate cooking energy into their programmes as cross-cutting issues. This created quite some momentum for biomass-based cooking energy solutions in the country. The most liked and viable technology was the Chitetezo Mbaula, a ceramic simple firewood stove, mostly produced and promoted in the rural areas.

[39] AICC, Care Malawi, Clioma Ltd., Chokoma Pusepa Project (Salima), CHSU, Concern Worldwide, COOPI, DFID, Environment Africa, EU, Farmers Union of Malawi, Goal Malawi, HRID Hestian Rural Innovation Development, Irish Aid, Masomphenya Owala Group (Salima), Mwanawaleza Ltd., Oxfam, Royal Norwegian Embassy, Total Land Care, UNDP, UNDP/MNREE, UNDP/PEI, US Embassy, USAID, WFP.

40 More information on MBAULA can be obtained from: www.renewnablemalawi.org/networks/MBAULA

At present the major donors for biomass energy interventions in Malawi are (in alphabetical order) European Union, Ireland, Norway, UK and USA.

- Major programmes supported by these donors in Malawi are without exception targeting the rural areas:
- DISCOVER (districts of Karonga, Salima, Dedza, Balaka and Nsanje),
- IRTICP (Increased Resilience through Improved Cooking Practices in Dedza and Ntcheu Districts),
- Msamala Sustainable Energy Programme in Balaka,
- Community Support to use renewable energies programme in Kasungu District and Likoma Island,
- Mobi+Lise in Mulanje District and some minor components of other projects.

Major implementation partners are Concern Universal, Cooperazione Italiana (COOPI), Goal Malawi, Mulanje Mountain Conservation Trust, Self-Help Africa and Total Landcare. Clíoma is an Irish consultancy company providing technical support on energy efficient technologies.

Most of these programmes keep on promoting the Chitetezo Mbaula that is emerging as a cost-effective appropriate firewood stove in rural areas.

Although the need for more efficient firewood stoves in the urban areas is big, no project currently works on establishing a sustainable supply into the urban areas of Malawi.

This proposal addresses this missing link.

2 Planned outcome

Energy service segment	Old targets		New targets	
Energy for lighting and electric household appliances	0	people	0	people
Cooking energy for households	0	people	62,500	people
Electricity and / or cooking energy for social infrastructure	0	institutions	0	institutions
Energy for productive use / income generation	0	enterprises	0	enterprises

3 Project approach

3.1 Energy technologies and services promoted by the EnDev project

The focus will be on the **promotion and marketing** of the **Chitetezo Mbaula** stove in the **major urban areas of Malawi**. It is a simple stove out of fired ceramic and currently the most affordable and popular portable household-size firewood stove in the country. It can reduce fuel consumption by up to 50%, especially when compared to outside three-stone-fires. As it can also burn other small biomass residues, it can reduce or in some cases even eliminate the need for purchased firewood.

The stove can be built with simple bucket moulds or more sophisticated paddle-moulds. The stoves are fired in simple kilns, which were introduced by GIZ-ProBEC in 2002 into the country. Production is mostly done by (women's) groups in villages, but recently small enterprises in the capital Lilongwe have emerged, who produce good quality stoves, yet they are lacking market penetration.

Clay is ubiquitous in most areas of Malawi, so the stove was perfected and promoted under EnDev-ProBEC in most rural areas of the country up to 2008.

Yet, the supply never reached the urban or peri-urban markets.

One of the biggest advantages of the Chitetezo Mbaula stove for urban areas is its portability so that it can be easily used in rented houses, where the landlords don't allow dwellers to use firewood inside the kitchen out of fear that the walls become black with soot. A portable stove allows cooking outside on the sheltered veranda, a typical feature of urban houses. The alternative would be the use of charcoal as cooking fuel, which burns almost smokeless once it is lit. However, charcoal is more expensive per energy delivered and is more unsustainably produced than un-carbonised firewood.

The Chitetezo Mbaula stove allows urban residents to use the cheaper firewood, which is an incentive towards a gradual fuel-shift to use more firewood instead of charcoal. So a wider uptake of the stoves is hoped to reduce the overall primary wood-energy needed for cooking, as with the current charcoal making practices, a major part of the primary energy is lost in the process of the charcoal making.

3.2 Approach to provide electricity to households

Not relevant for this proposal

3.3 Approach to provide clean cooking technologies to households

Key Intervention 1: Enhancing production capacities and transportation of stoves to urban areas

EnDev-ProBEC assisted over 40 partner organisations in Malawi to train stove producer groups in many parts of the country. In 2008 the annual production was exceeding 10,000 Chitetezo Mbaulas stoves.

Yet, the big bottleneck turned out to be weak market linkages: A good stove producer is not necessarily a good stove sales-person. So quite some stove producer groups slowed down or even stopped their production when the immediate market in their surroundings was satisfied and the demand slumped. There is a big potential to revive those production capacities if they can be assisted to extend their market linkages into the urban areas. For this, special sales-entrepreneurs have to be built up. The target is to have at least one major entrepreneur / transporter with a truck in each of the 3 regions of Malawi (South, Central and North). Depending on the needs of the identified entrepreneurs, the project will provide a basic start-up support for mobility and operational costs to start the transport of stoves from the rural production centres into the urban areas. The project will also provide promotion materials, business advisory services and market linkages to the outlets and marketing structures.

Once the entrepreneurs start making profits, their businesses are expected to grow and run on a commercial basis without further outside input to become sustainable. This is expected to be well achievable within one year.

Outlets and market structures will be created with the key intervention 2.

Key Intervention 2: Creating outlets and sustainable marketing structures in the major urban and peri-urban areas of Malawi

Once stoves reach the urban market through the structures created under Key Intervention 1, they should go to distinctive sales outlets in strategic places in the cities e.g. on the major markets in vicinity of the firewood and charcoal vendors, where the customers anyhow pass on a regular if not daily basis to get their cooking fuel supplies.

The plan is to have up to 20 sales agents as independent entrepreneurs in the major cities, who receive the stock of stoves from the transporters, provide some warehousing capacity for one truck-load and then sell the stoves with a mark-up to sustain their businesses on the long-run. In the beginning the sales agents will get a very modest financial support not exceeding 50 EUR per month per sales agent. This will cover a basic pay in line with the minimum wages, a support for the rent of the market stall and warehouse and the market stall fees due to the city assemblies.

These permanent outlets should all be carrying the same message in the branding image of the Chitetezo Mbaula.

Branding materials will be provided by the project, in the first year at reduced cost to the sales agents or for free as an incentive for outstanding performers. A catchy logo for the Chitetezo Mbaula has already been created.

The promotion and marketing campaign has to be designed in more detail, but the core elements are distinct branding of the Chitetezo Mbaula as a 'modern energy device' with a whole range of consistent branding materials from signposts, advertising (on roadsides, newspapers, magazines etc.), wearable outfits (caps, T-shirts, aprons), and other highly-visible material like calendars or car-stickers for the annual road tax.

Monthly lucky draws will be held on the basis of the sales cards of the people that purchased a stove in the previous month. This will give an incentive for the customers to provide their contact details and ease the monitoring of the stoves sold.

Prizes will be coveted modern devices like cellphones or electric home-appliances, as well as renewable energy appliances like high-quality solar lanterns to ease the impact of the frequent load-shedding: most urban areas suffer regular load-shedding on 2-3 days per week, sometimes from morning to 8 p.m., including three hours of darkness.

To incentivise competition among the sales outlets and create more public awareness, the lucky draw will be held every month at different locations, selected according to the performance of the sales agents. The locations will be announced on the radio and the newspapers, leading to increased publicity.

The permanent sales agents will be encouraged to employ mobile stove vendors, who will penetrate further into the high-density dwelling areas with branded bicycles and a trailer to carry the stoves. Access to these bicycle trailers will be facilitated by the project, but the stove vendors will work entirely on commission and be under the responsibility of the sales agents. Like this it is expected that monthly stove sales can go from an initial 100-200 stoves per city to over 500 stoves per month, and from 50 to over 200 in other major district capitals like Salima.

Financial support through the project will be gradually reduced once the sales agents start making profit and will end latest after 12 months. From that point onwards it is expected that the market linkages along the entire chain from stove production via transporters to sales agents are well established and that everybody along the marketing chain makes enough profit to sustain their businesses on a commercial basis.

In the absence of an EnDev office in Malawi, the management of the project will be done through the Malawi GIZ country office in cooperation with the local non-for-profit NGO "Area 55 consulting" as the executive management unit. Area 55 will be responsible for the technical assistance, the M&E and the reporting to EnDev. Clíoma Ltd will provide technical support and assist with quality control of the stoves where needed.

The director of Area 55 Mrs. Maya Stewart has cooperated with GIZ-ProBEC already in 2009 and 2010 and has experience with the marketing of energy saving technologies developed by EnDev-ProBEC like the institutional stoves and the tobacco curing barns. She has already started with the promotion of the Chitetezo Mbaulas, but on a low budget that is within her means. In November 2012 Area 55 will host a communication specialist from a well known UK advertising company for one month. This is facilitated by an internship programme for high-level professionals in creative jobs in the developed world, who need a little creativity boost, e.g. through exposure to different life-circumstances in a developing country. Area55 will provide accommodation in a local family in return for his services and input into a marketing strategy for the stoves, together with her marketing manager.

Each firewood stove sold in the urban areas will not provide 100% access to modern energy, as most urban households also have a charcoal stove, which will not be targeted with this

project. Thus each household reached will only be counted by 50%. This means that on the basis of an average 4.4 household members in the urban areas, 28,409 stoves will have to be sold to reach 62,500 people.

This target will be achieved without further project intervention latest in year two, in 2014.

3.4 Approach to provide access to modern energy services for social institutions

Not relevant for this proposal

3.5 Approach to provide access to modern energy services to SME's

Not relevant for this propsosal

4 Expected impacts of the project intervention

Impact	Possible indicators
Environment	Reduced overall demand of biomass energy and potentially reduced charcoal demand through partial substitution of charcoal through firewood; indicators: number of stoves sold to households (stove sales records); number of households that indicate potential shift from charcoal to firewood (user survey)
Health	Reduction of smoke and heat exposure; indicators: percentage of households that perceive there has been a reduction in health problems that were caused by the use of fuels in inefficient systems for cooking (user survey)
Poverty / livelihood	For the users more money available at cause of lower expenses for fuel, more income for stove producers and retailers; indicators: savings on monthly fuel expenditure (user survey); stove producers, transporters of stoves and retailers perceive a rise in their income and improvements in their livelihoods (survey)
Education	
Governance	

5 Budget

5.1 GIZ budget

	EUR
1 Human resources and travelling	0
2 Equipment and supplies	0
3 Funding financing agreements / local subsidies	200.000[41]
4 Other direct costs	33,242
5 Total direct costs	233,242
6 Mark up costs / administrative overheads / imputed profit	16,758
7 Cost price	250.000

[41] See 5.2.

5.2 Area 55 budget

	EUR
1 Human resources and travelling	62,000
2 Equipment and supplies	50,000
3 Other costs: promotion material and campaigns	88,000
4 Total costs	200,000

Mali

Project phase	01.2013 – 12.2014[42]					
Project budget	850,000 EUR					
Target groups	Households and social infrastructure in rural municipalities in Mali					
Expected outcome at project end					old target	new target
Number of people	Energy for lighting and electric household appliances					0
	Cooking energy for households					0
Number of institutions or enterprises	Electricity and / or cooking energy for social infrastructure					0
	Energy for productive use / income generation					50
Promoted technology	[x] Solar	[ ] Biogas	[ ] Stoves	[ ] MHP	[ ] Grid	[ ] Other
Summary of key interventions and outputs	In order to increase sustainability of operations in Battery Charging Stations (BCS) erected during ELCOM 1 & 2, the following interventions are foreseen: • Promotion and diversification of activities in BCSs, thereby upgrading those to 'Energy Kiosks'; • Strengthening / improvement of BCS management; • Facilitating access to good quality batteries for rural populations enabling them to better make use of the BCSs; • Improvement of monitoring of use made of BCSs through installation and utilisation of data loggers in all BCSs. In addition, installation of a minigrid in one village, begun during ELCOM2 but halted due to the putsch, will be completed during ELCOM3					
Coordination with other programmes						
Lead political partner	Malian Agency for Rural Electrification (AMADER), Malian Ministry of Energy and Water, Malian Ministry of Decentralization.[43]					
Implementing organisation	GIZ					
Implementing partners	rural communities and private operators					
Project manager	Name: Dirk Betke; Moussa Doumbia			Mail: dirk.betke@giz.de; moussa.doumbia@giz.de		

[42] New proposal for ELCOM3 to secure sustainability of ELCOM1 and ELCOM2 outcomes in the view of the political situation.
[43] Since cooperation with the Malian government is suspended, presently the function of the lead political partner is strongly limited.

1. Situation analysis

1.1. Energy situation

Mali is one of the least developed countries with over 70% of its 15 million inhabitants living below the 2 USD per day poverty threshold. 77% of energy provision is based on wood fuel including charcoal. Importation of fossil fuels makes up 16% of the national budget, increasing by one tenth yearly, which has serious consequences for the economy.

Electricity only accounts for 3% of Malian energy consumption. Less than 25% of the Malian population is connected to the national grid; official statistics show that urban zones are only partly electrified while no more than 14% of the rural population has access to electricity.

1.2. Policy framework, laws and regulations

The current energy policy is insufficiently developed to properly address the growing demand for electricity. The national utility Energie de Mali (EDM) is loss-making and only manages to connect 60 urban communities to the national grid. The Malian Agency for development of household energy and rural electrification AMADER focuses on rural zones and works through public private partnerships at local level in order to provide electrification to rural communities that are not connected to the grid.

1.3. Institutional set-up in the energy sector

Economic and social development and improvement of basic services require access to energy. In fact the demand for electricity currently increases by more than 10% annually, notably through urbanisation, industrialisation and mechanisation of rural labour.

The lack of availability of electricity requires an increase of production potential. The situation is aggravated by the increased cost of fossil fuels required in rural zones to operate diesel generators installed through the so-called PCASER programme of AMADER.

Central government institutions largely don't have the means and the capacity to achieve their objectives. Several rural zones for the medium long term will not be covered as there is no local capacity to implement the – in itself ambitious – programmes. The fact that energy provision is not addressed in the decentralization policy and often not mentioned in development plans jeopardizes longer term sustainability of such provision.

By integrating these aspects ELCOM aims to remedy this situation and contributes in achieving the national indicators that stipulated – before the current crisis – a rural electrification rate of 14% in 2012 and 55% in 2015.

1.4. Major donor activities

Renewable energy sources for electricity production in Mali are exploited to a small extent only. given that Mali is one of the least developed countries, given the relatively high cost of fossil fuels and the strong and growing demand for electricity, mobilisation of financial resources to support electrification based on renewables has been sought in recent years.

Donors involved were a.o. the WorldBank, KfW, DGIS. Activities in Mali were implemented through departments of the Ministry of Energy and Water (MEE), like the Directorate for Energy (DNE), AMADER and the research centre for solar- and renewable energy (CNESOLER) through various programmes (PRODER, PEDASB, PASE, SREP, ELCOM).

2. Planned outcome

Energy service segment	Old targets		New targets	
Energy for lighting and electric household appliances	19,800	people	19,800	people
Cooking energy for households	0	People	0	people
Electricity and / or cooking energy for social infrastructure	180	institutions	180	institutions
Energy for productive use / income generation	0	enterprises	50	enterprises

Nb: whereas ELCOM 1 & 2 output targets have been largely achieved, current outcome is only approximately one third of the target, i.e. BCSs are insufficiently used. The objective of ELCOM 3 thus is to boost BCS usage, so as still to achieve the ELCOM 2 outcome target, thereby directly making the activity more sustainable. In the process some 20 new SMEs will be electrified while 30 present BCSs will be turned into SMEs resulting in new access for 50 SMEs.

3. Project approach

3.1. Energy technologies and services promoted by the EnDev project

ELCOM / PACT over the last years became an important actor in the search for solutions to reduce the energy poverty of the rural Malian population. To continue this development, ELCOM under its third phase intends to implement a spectrum of activities over the coming two years in order to preserve / strengthen the results of ELCOM 1 & 2.

In the context of the current crisis in Mali, whereby international cooperation with the Malian government is generally suspended, communities play a more important role in conserving the achievements of development than before. To some extent they can resist the crisis by handling matters through communal structures and at communal level. This way of overcoming the crisis in turn leads to a strengthening of sectors at community level, including rural electrification. Against this background the third phase of ELCOM is in line with the national Electrification Strategy, while aiming to consolidate the achievements of the previous two phases.

During ELCOM 1& 2, 17 rural communes benefited from the support of ELCOM through the electrification of their public infrastructure (town halls, health centres, schools, solar street lights) and the erection of BCSs in 50 villages to serve beneficiaries in households.

Monitoring has shown that the frequentation of the 50 BCSs at present is insufficient to (financially) support the proper maintenance and the amortisation of hardware of PV infrastructure in the communities concerned.

Analysis of the results of a study to investigate underlying causes shows that to some extent this is caused by a lack of (good-quality) batteries. In addition the handling of certain BCSs by the respective technicians is problematic. Thirdly the general lack of activity at several BCSs (many are closed during daytime) implies that usage is less than it might have been.

ELCOM 3 thus aims to improve the frequentation of BCSs by making them more dynamic through diversification of services, by facilitating battery charging through supporting the provision of good-quality batteries in a hire-purchase system and by improving management.

Moreover the above analysis underlines the importance of proper monitoring; as also in that respect problems have been detected, as an activity during ELCOM3 improvement of monitoring through installation of data loggers is foreseen.

Finalising activities of ELCOM2, under the third phase construction work on a solar-hybrid powered minigrid in the commune of N'Tjiba will be completed, serving over 2,000 people by electrification of approximately 200 households, public infrastructure and production facilities. N'Tjiba presently is not served by the national grid of EDM, nor by AMADER.

3.2. Approach to provide electricity to households

As indicated above, ELCOM 3 aims to increase access to electricity for households by stimulating the use of BCSs erected during ELCOM 1 & 2, and by completing the minigrid in N'Tjiba which will create access to electricity for 2,000 people in 200 households.

3.3. Approach to provide clean cooking technologies to households

Not relevant for this proposal

3.4. Approach to provide access to modern energy services for social institutions

The consolidation phase will permit to strengthen M&E in a hundred social infrastructures electrified by ELCOM so far. This will eventually benefit the support in improvement of working conditions in town halls, health centres and schools.

3.5. Approach to provide access to modern energy services to SME's

The minigrid foreseen in N'Tjiba, in addition to providing electricity to some 200 households and social infrastructure, will have sufficient capacity to also electrify some 20 small and medium size enterprises. The transformation of BCSs into Energy Kiosks as described above in many cases will turn the BCS into an SME. It is estimated that up to 30 out of the 50 current BCSs will thus become SMEs.

4. Expected impacts of the project intervention

Impact	Possible indicators
Environment	Reduced CO_2 emissions; reduced pollution (dry cell batteries, kerosene spill).
Health	Improved working conditions for medical personnel during night time interventions; Reduction of kerosene fume induced health problems; Increased effective vaccination coverage by cold chain improvement.
Poverty / livelihood	Electrified and thus increased / more efficient income generating activities; Livelihood improvement through provision of electricity for households (light, television, radio, ventilators)
Education	Increased education through organisation of evening courses (and – potential - use of audiovisuals at school)
Governance	More effective and more efficient administration through computerization and improved working conditions in town halls

5. Budget

	EUR
1 Human resources and travelling	445,000
2 Equipment and supplies	127,000
3 Funding financing agreements / local subsidies	50,000
4 Other direct costs	101,751
5 Total direct costs	723,751
6 Mark up costs / administrative overheads / imputed profit	126,248
7 Cost price	850,000

Tanzania

Project phase	12.2012 – 12.2014					
Project budget	EUR 500,000					
Target groups	Rural firewood consuming households (3 stone fire users) Urban commercial food vendors consuming charcoal (metal box stove users)					
Expected outcome at project end					old target	new target
Number of people	Energy for lighting and electric household appliances					45,000
	Cooking energy for households					
Number of institutions or enterprises	Electricity and / or cooking energy for social infrastructure					
	Energy for productive use / income generation					80 producers; 1,000 food vendors
Promoted technology	[ ] Solar	[ ] Biogas	[×] Stoves	[ ] MHP	[ ] Grid	[ ] Other
Summary of key interventions and outputs	The project will start its activities in two rural districts and one regional urban capital (Mwanza) in the Lake Zone. Upon review and approach refinement, the programme will upscale to an additional two rural districts and Urban Musoma in the Lake Zone in year two. The project comprises three components: Component 1 – Diversification of improved cookstove production: • Development of a supply chain for newly designed wood burning ceramic stoves (fixed and portable) by enhancing ceramics production, local retailing, and hearth installation. • Support of stove manufacturers to diversify their production to include multi-spot charcoal stoves for commercial food vendors. Component 2 – Enterprise Development Services: Provision of enterprise development services to empower stove service providers to viably and independently establish and grow their operations. Component 3 – ICS Marketing: Linking manufacturers, service providers and customers (rural households and commercial food vendors) by means of participatory family energy budgeting and strategic public technology demonstrations in order to accelerate widespread and immediate dissemination of appropriate ICS technologies.					
Coordination with other programmes	Lake Zone Renewable Energy Programme Tanzania					
Lead political partner	Ministry of Energy and Minerals					
Implementing Organisation	SNV in cooperation with GIZ office Tanzania					
Implementing partners	The Lake Zone Renewable Energy Consortium (LZREC); Anglican Church of Tanzania (ACT), Mara Diocese (Musoma); TSAEE, an agricultural extension society based in Mwanza; EMEDO, an NGO based in Mwanza					
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1 Situation analysis

1.1 Energy situation

Tanzania, with more than 42 million inhabitants and high population growth rates of 2.5 – 3%, is classified by the UNDP's Human Development Index as ranking 152 out of 187 countries in the world. It is estimated that 67.9% of Tanzanians are below income poverty line of purchasing power parity USD 1.25 per day. In addition, the Tanzanian Poverty and Human Development Report indicate that poverty rates remain highest in the rural areas.

The energy balance in Tanzania is dominated by biomass fuels. Broadly, the main energy consumption sectors in Tanzania include: household, manufacturing, agriculture, commerce, transport and mining. The household sector constitutes the largest share of total energy consumption in the country (91% of the total energy demand, mainly used for cooking and lighting).

Increasing demand of biomass fuels for cooking coupled with use of traditional unimproved cookstoves and a dwindling supply have created energy security and environmental degradation challenges for the majority of the poor both in rural and urban areas. By end of 2010, the estimated annual supply potential of biomass fuels for cooking in Tanzania was around 18 million cubic meters while demand was around 50 million cubic metres. To meet biomass demand people are forced to over harvest existing natural forests contributing to the deforestation rate of around 403,000 ha per year. Also, Green House Gas (GHG) emissions resulting from unsustainable biomass consumption are leading towards adverse climatic change with direct consequences for livelihoods and country's economic growth. In 2010, UNEP estimated that the cost of climate change to Tanzanian economy will be between 1 – 2% of Gross Domestic Product (GDP) annually by 2030.

1.2 Policy framework, laws and regulations

The Government of Tanzania has developed policies that highlight national needs to promote efficient energy conversion and end-use technologies in order to save resources; reduce the rate of deforestation and land degradation; and minimizing the threats of climate change. For example, the Forest Act (2002), Rural Energy Act (2005) and Environmental Management Act (2004), all recognise the fact that increasing demand for biomass fuels, coupled with weak regulation and poor coordination, is having a significant impact on deforestation and forest degradation and call for a common strategy to promote efficiency in the production and consumption of biomass energy.

Additionally, the Government of Tanzania (GoT) is currently developing a Biomass Energy Strategy (BEST) in cooperation with the European Union Energy Initiative Partnership Dialogue Facility (EUEI-PDF). The lessons and experience gained in developing improved cookstove market are providing valuable inputs to the on-going process of BEST development and its implementation.

As a whole, Tanzania's forestry, energy and environment legislation all recognise the fact that increasing demand for wood based fuels, coupled with weak regulation, is having a significant impact on deforestation and forest degradation. To address this problem, the Government intends to increase the efficiency in the production and consumption of biomass energy.

While it is evident that production and use of improved cookstoves can contribute to the realization of the policy directions, there is limited clear guidance, how biomass energy objectives will be achieved in a sustainable manner that improves energy access to predominantly rural citizens while contributing to economic development priorities.

1.3 Institutional set-up in the energy sector

Four ministries share responsibility to address household energy issues, including the Ministry of Energy and Minerals (MEM), Ministry of Natural Resources and Tourism (MNRT), Vice President's Office -Division of Environment (VPO-DoE), and Prime Minister's Office – Re-

gional Administration and Local Government (PMO-RALG). MEM is responsible for policy matters relating to the household energy. It has a Renewable Energy Department, which is mandated to support policy implementation. The Rural Energy Agency (REA) is an autonomous entity under MEM tasked to improve access to energy for rural Tanzanians through the development of rural energy sources, technologies and projects. The promoted technologies also include improved cookstoves with a focus to institutional stove applications (schools, hospitals, etc).

MNRT, and more specifically its Tanzania Forest Service (TFS), is responsible for overseeing and regulating the production, licensing and transport of wood fuel (firewood & charcoal) and is the lead government agency on the "supply side" of biomass energy. VPO-DoE is mandated to oversee and regulate environmental management across government departments and agencies. VPO has the authority to oversee the aforementioned ministries to ensure protection of the environment. PMO-RALG is responsible for co-ordinating the regional secretariats and Local Government Authorities (LGAs) and is the formal contact point between LGAs and national ministries. LGAs play an increasingly important role in local energy related policy and strategy implementation.

1.4 Major donor activities

The **World Bank** considers charcoal as a key issue of economic and environmental significance within the energy sector and has supported a range of strategic studies and policy briefs related to the charcoal industry. The Bank is supporting a project on biomass briquettes to substitute charcoal through its Biomass Energy Initiative for Africa (BEIA).

The **Swedish International Development Cooperation Agency (Sida)** supports the Rural Energy Agency in promoting renewable energy technologies including improved cookstoves. The **Norwegian Government** has been supporting TaTEDO, a local NGO in promoting efficient biomass technologies across ten regions for more than 10 years. Other efforts in Tanzania include support to REDD+ pilots throughout the country.

The **Finish Government** is supporting climate change adaptation throughout its development assistance as a cross-cutting issue. Regarding improved cookstoves, FINIDA supported a one year project to disseminate stoves to communities around Mt. Kilimanjaro.

Between 2005 and 2010, the **German government** supported the Programme for Basic Energy Conservation (ProBEC), a SADC regional initiative aimed at improving quality of life (particularly for low-income people) through access to affordable, reliable and sustainable modern biomass energy services. ProBEC received co-funding from the **Dutch** and Norwegian governments. too and has gone through four phases of introducing, piloting, scaling up and launching a range of fuel-saving technologies and best practices. The chosen technologies are clay stoves, "bonfire" kilns for firing ceramic stove components, plant oil stoves, "rocket" stoves, tobacco curing barns, baking ovens, food dryers and fryers. When ProBEC phased out most of its activities in Tanzania have been taken over by the Rural Energy Agency however with significant less resources.

USAID is supporting Biomass conservation through its Environment and Natural Resources Management Programmes. In the energy sector USAID financed a 2-year project to market biomass briquettes in Dar es Salaam manufactured by a private company (East Africa Briquettes Company Ltd in Tanga). The project has resulted in sales of these briquettes rising to around 2 tonnes per day and makes it by far the most successful briquetting venture that Tanzania has yet seen.

UNDP is implementing a wide-ranging Energy and Environment Programme with activities that include accelerating access to renewable energy sources such as PV electricity (in collaboration with GEF), supporting the sustainable use of wood fuels through the introduction of energy-saving stoves and improved production technologies, integrating environmental concerns into development policies and plans, reducing the dependence of the poor on natural resources for their livelihoods, conserving biodiversity while ensuring that communities

benefit from these resources and supporting efforts to mitigate and adapt to the impacts of climate change.

Under African Caribbean and Pacific – EU Energy Facility funding window, **EU** is supporting two improved cookstoves programmes in Tanzania. Also, the Developing Energy Enterprises Project (DEEP) East Africa is an EU funded project linked to GVEP. The project started in 2008 and runs for five years in Kenya, Uganda and Tanzania. In Tanzania, DEEP is carried out in the Lake Zone area. More than 300 entrepreneurs (domestic charcoal stoves, briquettes and solar) have been provided with technical advice and business coaching, including support in access to capital.

2 Planned outcome

Energy service segment	Old targets		New targets	
Energy for lighting and electric household appliances	0	people	0	people
Cooking energy for households	0	people	45,000	people
Electricity and / or cooking energy for social infrastructure	0	institutions	0	institutions
Energy for productive use / income generation	0	enterprises	1,080	enterprises

3 Project approach

3.1 Energy technologies and services promoted by the EnDev project

The project will focus its activities on the Lake Zone regions of Kagera, Mwanza and Mara, home to an estimated 8 million people (1.6 million households). More than 95% of these homes rely on solid biomass fuels (firewood, charcoal) for cooking and heating via inefficient cooking methods / technologies. With 37% of persons living below the poverty line, alternative energy sources are costly and out of reach to the majority of citizens. SNV, which will implement the project, has long presence in the Lake Zone and thus a well developed structure for supporting stove activities in rural areas. As a founding member of the Global Alliance for Clean Cookstoves and founding partner in Tanzania's National ICS Task Force with key national actors (including TaREA, TaTEDO, REA, MEM, MNRT), SNV can ensure that the lessons learnt of the programme are continuously fed into the ICS sector as a whole. The experiences gained throughout the active implementation in the Lake Zone will be presented to local, national and international multi-stakeholder platforms.

The project will work with a consortium arrangement. It is made up of several key stakeholders who have experience in promoting renewable energy technologies and services. Consortium members include:

- Anglican Church of Tanzania (ACT), Mara Diocese (Musoma)
- EMEDO, an NGO based in Mwanza, covering Ukerewe District
- KADETFU, an NGO based in Bukoba, with operations in Kagera
- ZARA Solar, a private company based in Mwanza
- TSAEE, an agricultural extension society based in Mwanza

In addition the project will work actively with Local Capacity Builders (LCBs) for the delivery of short term and context specific tasks, such as training, advice, organisational development, change trajectories, monitoring and evaluation, coaching, multi-actor processes, institutional and policy development work, knowledge brokering and learning programmes. Key

LCBs capable of advancing this portion of the programme include Chigoto Plus (business consultancy).

3.2 Approach to provide electricity to households

Not relevant for this proposal

3.3 Approach to provide clean cooking technologies to households

Wood Burning ICS

The program will support the production, marketing and supply chain for the energy saving wood burning stoves “Matawi”, The Matawi Stove combines the best elements of the Upesi cookstove (low cost, high durability) and the Rocket stove (high efficiency, clean burning with no need of chimney). Both the portable and the fixed version of the stove will be promoted.

The key component of the stove is the ceramic part. A high quality of this ceramic part is essential for the efficiency of the stove. The project will initially work with known ceramics artisans and associated women’s groups in Misungwi District of Mwanza Region to refine and upscale the production of high quality ceramic stoves and stove components. The programme will undertake a training seminar that reviews the principles of the stove (particularly dimensions), provide standardized moulds to artisans, and introduce methods for initiating mass production. The technical training will initially focus on supporting existing ‘champion’ stove producers in skills refining. These champions shall train emerging artisans and hearth installers in subsequent seminars of the program. Both theoratical and practical training will be provided by LCBs and include topics like product costing, quality control, production upscaling and hearth construction (for fixed stoves).

Distribution of the Matawi stoves will include Misungwi as well as neighbouring Sengerema, Kwimba, and Magu Districts and Peri-Urban areas of Mwanza City. Parallel to marketing activities additional ceramic producers will be identified and engaged in Matawi production. Market entry of the Matawi stove will be focused on utilizing the currently known supply channel of the ICS – local market retailers selling portable charcoal ICS and domestic ceramics. The project will support the distribution of the Matawi stove to retail markets and assist in brokering producer-retailer relations for the sale of the stoves.

Fixed versions of the Matawi will require the installation of the hearth within the domestic homestead. The project will provide technical support and training to local stove installers (masons, women and youth groups, etc) in both hearth construction and user training. The installers will be linked directly to both retailers and producers of the Matawi stove.

Commercial charcoal stoves

Medium scale improved cookstove manufacturers that are currently producing portable charcoal stoves will be supported to diversify their production to include multi-spot charcoal stoves for commercial food vendors. The project will support these manufacturers in upscaling their production capacity by providing technical training and joint learning (producer to producer knowledge brokering) in developing best production practices. In addition market entry of the products will be facilitated via public demonstrations and establishing retail linkages.

All stove enterprises and service providers engaged in the program will be linked to rural households and commercial food vendors via participatory family energy budgeting and public technology demonstrations in order to accelerate widespread and immediate dissemination of appropriate stove technologies. LCBs will organize meetings with communities at the ward level (avg. ~2,000 households) for awareness raising on energy issues (costs, supplies, options, benefits). Sessions will focus on participatory methodologies that help to define and clarify local biomass energy needs and cooking preferences. LCBs will also support individual households in efficient cooking practices (pot placement, stove height, temperature regulation, etc). The process will be inclusive of all family members and highlight economic and social impacts of domestic cooking alongside the dissemination of household budgeting

skills. Technology options and local stove sources will be identified in conjunction with available local financing sources (formal and traditional community credit).

LCBs will re-engage individual households who have undertaken initial family energy assessments. This will include follow-ups to household budgeting plans, engagement of ICS technicians and oversight during stove installation and usage to ensure quality control at the supply and demand interface.

The project will be implemented with an initial roll-out in 2 rural districts (wood burning ICS) and the major urban centre of Mwanza City (commercial charcoal ICS) in the Lake Zone. Upon review and approach refinement at the project mid-term, the intervention will upscale to an additional 2 rural districts and peri-urban Mwanza (wood burning ICS) and urban Musoma in Mara Region of the Lake Zone. Based on results achieved by the conclusion of the project, replication and up-scaling will be undertaken on a wider national level in neighbouring Zones of Tanzania.

3.4 Approach to provide access to modern energy services for social institutions

Not relevant for this proposal

3.5 Approach to provide access to modern energy services to SME's

Not relevant for this proposal

4 Expected impacts of the project intervention

Impact	Possible indicators
Environment	reducing greenhouse gas emissions total project period – 19,800 tons CO_2 broken down as follows: • 7,500 household woodstoves at 1.2 t = 9,000 t CO_2 • 1,000 commercial stoves at 10.8 t = 10,800 t CO_2
Health	reducing premature death and sickness related to indoor air pollution;
Poverty / livelihood	• 45% savings on cooking fuel for 45,000 persons • reducing the workload, especially benefiting women and children; • income generation and employment creation opportunities for 80 MSMEs and 1,000 food vendors
Education	
Governance	

5 Budget

5.1 GIZ budget

	EUR
1 Human resources and travelling	0
2 Equipment and supplies	0
3 Funding financing agreements / local subsidies	405,250[44]
4 Other direct costs	61,668
5 Total direct costs	466,918
6 Mark up costs / administrative overheads / imputed profit	33,082
7 Cost price	500,000

5.2 SNV budget

	EUR
1 Human resources and travelling	326,920
2 Equipment and supplies	34,000
3 Training and promotion material	18,250
4 Operation and Administration	25,080
5 Total costs	405,250

[44] See 5.2.

Annexes

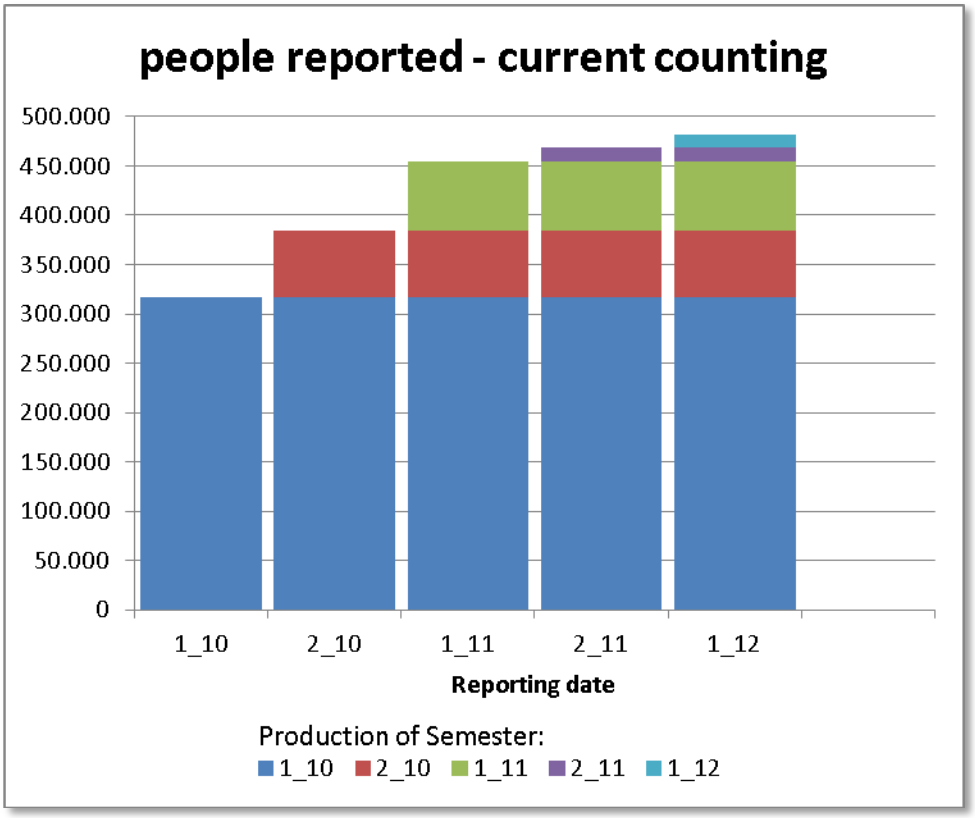
1. Uganda – proposal to pilot a new counting methodology for household stoves

Within EnDev the number of people reached by improved cookstoves follows the logic that a stove has:

- a lifespan in which it performs according to the required efficiency
- serves a certain number of people per household

The number of stoves sold is collected by the projects, the two factors above are analysed through tests and studies. The stove reporting is done at the reporting date, taking into consideration all stoves that have been build looking backwards in time within the lifespan. (e.g. a stove with 2,5 years lifespan: In June 2012 all stoves of the years 2010, 2011 and 1st semester 2012 will be reported, older stoves are assumed to not exist or perform any longer and are not reflected in the reported figures.)

Taking this example and plotting a simplified graph with the real Uganda stove figures the picture would look like this:

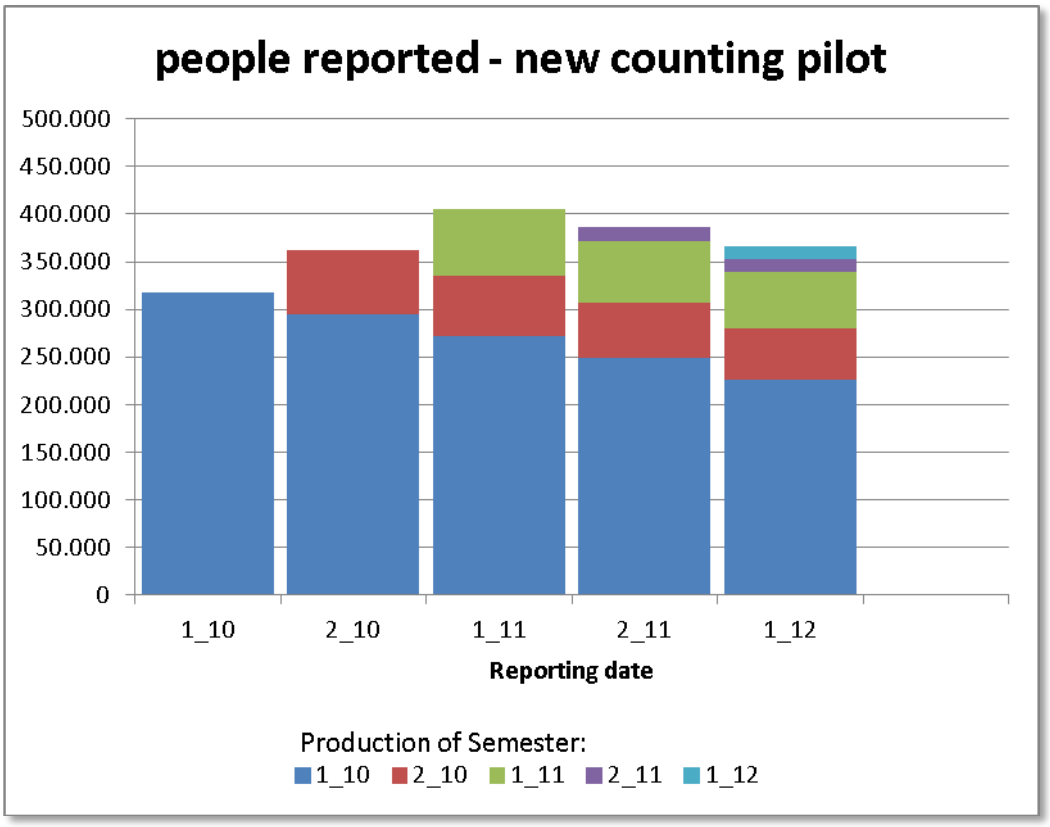


Studies in Uganda have shown that the real situation is more divers than shown above. The assumption that all stove are in use exactly for the duration of the lifespan does not reflect the reality in the consumer's houses. In fact, the studies have shown that there are stoves in uses that are much older than the expected lifespan. These stoves perform according to the EnDev expectations. On the other side there are also a few stoves which have serious damages even before the end of the expected lifespan. Considering these analyses of the studies a new counting / calculation methods could be developed. This model would follow the idea that all stoves of one production time have different lifespans, resulting in an EnDev counting that only counts them at 100% when they are produced and installed. During the

following semesters the number of stoves to be reported of a production date is decreased by a certain factor.

When applying the proposed counting / calculation model to the stove production figures of Uganda the results as displayed in the graphic below come up.

It can be seen that the share of each production semester decreases from one reporting to the next. It can also be observed that in semesters with a small ne production (as it happened in 2_11 and 1_12) the total figure to be reported drops from one to the next semester. This effect is expected to happen in Uganda also for the next reporting in December 2012. From June 2013 the results are expected to increase again due to the restarted activities.



The proposed counting / calculation method results in the short run in lower figures to be reported. However, EnDev would like to pilot such a counting as it reflects a more real situation. Nevertheless we would like to consider this as a pilot. The proposed counting increases the demand for additional studies in the field on a wider scale. It needs to be analysed if this additional effort can be achieved cost effective enough to justify the higher level in accuracy.

Even though the reported result of EnDev-Uganda drops with this new counting it should be acknowledged that the stove component in Uganda has operated at high cost efficiency. By applying the proposed counting EnDev-Uganda can report 366,000 people. A cost efficiency of less than EUR 2 per reached person is a very good result in that respect.

2. Concept Notes developed for EnDev RBF facility

Country	Title of Concept Note	RBF budget	External partner
Benin	RBF for lifting up 4 Offgrid PV market segments to the next level	6,000,000 €	
East Africa (regional)	Results-based financing for growth of the domestic biogas sector in East Africa	2,239,969 €	SNV
Ethiopia	Financial Incentive for Lantern and SHS Dissemination in Rural Ethiopia	3,401,610 €	
Ethiopia	Ethiopia Hydropower	2,149,093 €	
Ethiopia	Cooking stoves in Ethiopia	3,486,861 €	
Ghana	Biogas Minigrid	1,234,000 €	KNUST
Kenya	Biogas and energy efficiency in agriculture	1,050,000 €	
Kenya	Kenya Biogas-PV-Minigrids	1,494,000 €	
Malawi	'Rocket' Chicken Brooders in Malawi	1,571,405 €	
Malawi	Solar LED lanterns in Malawi	3,121,800 €	
Mozambique	pico PV in Mozambique	1,108,100 €	
Rwanda	Market Creation for Institutional Biogas	1,405,794 €	
Rwanda	Market Creation for LED Lighting	3,039,655 €	
Rwanda	Market Creation for Renewable Energy Mini Grids	2,986,820 €	
Rwanda	Marketing Support for the Improved Cookstoves in Rwanda	1,827,029 €	Practical Action
Tanzania	Pay as you go solar lighting and phone charging	2,550,000 €	GVEP
Tanzania	Rural Market Development for solar pico PV, Lake Zone Tanzania	1,185,000 €	SNV
Uganda	Develop a Commercially Viable market for Institutional Cookstoves in Uganda	730,000 €	GVEP
Bangladesh	Pico PV in Bangladesh	3,260,535 €	
Bangladesh	small solar home systems (SSHS) via IDCOL in Bangladesh	1,953,450 €	
Bangladesh	Market Development of Solar Irrigation in Bangladesh	3,125,000 €	SNV
Cambodia	The National Biodigester Programme of Cambodia	3,500,000 €	SNV
Indonesia	Indonesia Solar Local Production of "Solar Business Systems (SBS)"	1,770,800 €	
Indonesia	Kalimantan Micro-hydro Incentive Scheme (KALMIS)	1,910,000 €	

Country	Title of Concept Note	RBF budget	External partner
Indonesia	Upscaling of the Indonesia Domestic Biogas Programme (IDBP) in target areas with commercial potential	4,855,200 €	HIVOS and SNV
Nepal	RBF on rural business promotion with electricity in Nepal	1,500,000 €	
Nepal	RBF on Improved Water Mills (IWMs) in Nepal	1,270,000 €	
Nepal	Solar / wind hybrid battery charging stations in Nepal	1,791,250 €	Practical Action
Vietnam	Creating a Market Driven Biogas Sector in Vietnam	3,455,000 €	SNV
Bolivia	Pico PV in rural areas of Bolivia	1,200,000 €	
Peru	Pico PV in Peru	1,375,000 €	
Peru	Solar Water Heaters in Peru	1,100,000 €	