



IOB Evaluation Newsletter

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Renewable energy in Rwanda: benefits for households, yet limited impact on CO₂ reduction

Rwanda: benefits for households, yet limited impact on CO₂ reduction | IOB Evaluation Newsletter # 1408 | Renewable energy in Rwanda: benefits for households, yet limited impact on CO₂

Rwanda's economic recovery goes hand-in-hand with a strong growth in demand for energy for production, for household lighting and for cooking. The Government of Rwanda is determined to develop the energy sector at a high pace, with emphasis on the electrification of the country. In 2008, the Dutch Ministry of Foreign Affairs launched the Promoting Renewable Energy Programme (PREP). Rwanda was among the countries most supported by PREP resources.

IOB evaluated the impact of four programmes supported: the roll-out of the electricity grid (EUR 30 million); the national biogas programme (EUR 5 million); the marketing of personal solar lighting (EUR 340,000); and a project aimed at strengthening the

national energy authority in Rwanda EWSA (EUR 3 million). To measure the impact, both quantitative and qualitative research methods were applied. IOB shows the results in the evaluation report *Access to Energy in Rwanda: Impact evaluation of activities supported by the Dutch Promoting Renewable Energy Programme*.

The renewable energy interventions were highly relevant to the policy objectives of both the Government of Rwanda and the PREP. The electricity roll-out programme was efficient and effective in providing access to electricity and has various impacts on the households. The other activities were less efficient and effective. The interventions resulted in only a modest reduction of CO₂ emission.

Background

In 2000, the Government of Rwanda formulated its overall development objective that aspires to double the per capita income by 2020, thereby transforming Rwanda from a low-income country into a middle-income country. Energy is vital to that end and the Government of Rwanda developed a series of energy strategies over time, all aimed at reducing the use of firewood for both cooking and (agro-) industrial processes through diversification of energy sources, and enhancing the connection of people's homes to the electricity grid.

Dutch support to the energy sector encompassed EUR 85 million for: (i) electricity generation, transmission and distribution; and (ii) cooking energy (both biomass production and efficient use of it). In May 2008, the Government of Rwanda and development partners signed a Memorandum of Understanding for supporting the national electricity roll-out programme. While all development partners aligned to the policy and strategy for electrification of Rwanda, only the Netherlands aligned to the administrative and financial systems of the country as well. The policy dialogue between the Government of Rwanda and the Embassy of the Netherlands in Kigali was considered open and constructive. Consequently, the Netherlands was able to influence Government of Rwanda's policies and practices, in areas such as energy generation from renewable sources, harmonised and simplified regulations in the woody biomass and charcoal chains, and enhanced coordination amongst institutions.

Construction of a transmission tower



Methodology

IOB commissioned three impact studies of renewable energy projects in Rwanda to a consortium integrated by the German Rheinisch-Westfälisches Institut für Wirtschaftsforschung (RWI) and the Institute of Social Studies (ISS) at Erasmus University Rotterdam in the Netherlands. For the evaluation of the roll-out of the electricity grid, the national biogas programme and the marketing of personal solar lighting, both qualitative and quantitative techniques were applied, including a randomised controlled trial (RCT), the first ever conducted on personal solar lamps. The evaluation of the project aimed at strengthening the energy authority EWSA applied qualitative techniques only.

The report *Access to Energy in Rwanda: Impact evaluation of activities supported by the Dutch Promoting Renewable Energy Programme (PREP)* is one of the studies that underpin the policy review of the PREP to be published in early 2015.

Results

Relevance – The interventions for promoting renewable energy in Rwanda were relevant to the policy objectives of both the Government of Rwanda and the Ministry of Foreign Affairs of the Netherlands.

Effectiveness – Together, the four programmes contributed to providing access to energy to some 300,000 households, of whom 280,000 got access to grid-supplied electricity. Approximately 60% of the households in electrified rural communities have been connected and use electricity now. Both biogas digesters and solar lamps registered a low uptake and have been less effective in providing access to energy for lighting and cooking.

The Netherlands played a catalytic role for the roll-out of the electricity grid by funding the Investment Prospectus that encouraged other partners to co-finance. The support to the National Domestic Biogas Programme and the Sustainable Energy Development Project contributed to the development of capacities and knowledge of national partners in the area of renewable energy.

Efficiency – The aligned support to the electricity roll-out programme has been efficient since transaction costs and the average cost per connection declined gradually over time. The uptake of biogas digesters remained low, implying high prices per digester and a less efficient programme implementation. The tender procedure applied for the capacity building programme to EWSA created inefficiencies due to piecemeal implementation of small activities.

Jean Bosco and his mill connected to an EWSA pay-as-you-go meter



Jean Bosco lives in a community that was electrified in 2013. He was amongst the first to connect and immediately bought a dynamo for his grinding mill, which was previously run on diesel. A few other millers followed his example, so there are now seven electric mills in his community. Nevertheless, he has attracted a few more customers and is making more profit than before. He has been able to reduce the price for his services and thanks to two energy-saving bulbs that illuminate the shack where he operates his mill he has extended operating time by two hours per day. The higher profits from milling have allowed him to buy health insurance for his children and he has bought some land for his family.

Impact – In terms of household income and expenditure, grid-supplied electricity has had no impact on the household expenditure for energy, except for 10% of the households who use electricity for income-generating activities. Biogas digesters have a long payback period on the investment before they become profitable to the household, whilst the impact on income of a pico-PV system is negligible.

Welfare impacts are most pronounced in the case of grid-supplied electricity: electricity prolongs the day and has an impact on health, education, the access to information and human behaviour. The welfare impacts of biogas and pico-PV systems mainly relate to comfort (a cleaner kitchen, indoor lighting) and health.

The impact on the environment is modest, both in positive and negative terms. Only biogas digesters reduce the volume of fuelwood used for cooking, but the number of digesters in operation is still small. Solar lamps (pico-Photo Voltaic sets) lead to a reduction in the use of small batteries, but the battery of the set itself may end up in the environment and have a polluting effect.

Sustainability – The Government of Rwanda's strong commitment to develop the energy sector is an important precondition for sustainability.

In remoter and less inhabited areas to which the electricity grid will be extended, the electricity consumption is extremely low. Consequently, EWSA's operational costs will not be covered by revenues from electricity sales putting its financial balance under pressure. Cross-subsidies will be required to sustain the supply to rural consumers.

No sustainable biogas market has developed, due to high costs of biogas installations and perceived disadvantages such as an increased workload. Although a commercial market is emerging for small solar devices, better quality products merit external support in order to set quality benchmarks in the market.

Conclusion

The activities in Rwanda have contributed to the four specific objectives of the PREP to varying degrees. The interventions have: (i) provided access to energy to almost 1.5 million persons (electricity, solar lamps, biogas); (ii) contributed to the sustainable production of (woody) biomass for energy purposes through reforestation programmes; (iii) influenced the strategy of the World Bank and set quality standards for solar energy; and (iv) contributed to the technical and management capacities of EWSA and energy actors in the market.

Policy implications

In Rwanda, Dutch-supported activities in renewable energy were implemented by the Government of Rwanda, the World Bank, the German GIZ and an array of other actors. Delegation and outsourcing had the advantage of limited management and transaction costs to the Ministry, but compromised the Ministry's accountability, due to the restricted insight in the results achieved.

In the frame of the division of labour amongst development partners, the Government of Rwanda requested the Netherlands to join the energy sector, and the Netherlands consented. However, as a result of the 2011 and 2013 changes in Dutch policies on international cooperation, the energy sector is no longer amongst the funding priorities. To the Government of Rwanda this retreat was undesirable, considering the prominent role of the Netherlands in the energy sector.

Small renewable energy interventions such as personal solar lamps and biogas digesters offered through a market approach are unlikely to result in a significant reduction of CO₂ emissions.



The Policy and Operations Evaluation Department (IOB) of the Ministry of Foreign Affairs carries out independent assessments of the efficiency, effectiveness, relevance, coherence and sustainability of Dutch foreign policy. It thus provides accountability concerning the results of policy, as well as information to enhance policy.

The quality of IOB's assessments is guaranteed by means of systematic and transparent procedures.

All IOB evaluations are in the public domain and are brought to the notice of parliament. IOB also seeks to make evaluations accessible to the Dutch public and to partners in the countries concerned. Reports can be freely obtained and a summary of the most important findings is published in the form of the IOB Evaluation Newsletter.

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Access to Energy in Rwanda: Impact evaluation of activities supported by the Dutch Promoting Renewable Energy Programme

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