Ministry of Foreign Affairs

IOB Evaluation

Renewable energy

Policy review on the Dutch contribution to renewable energy and development (2004-2014)

Summary report

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List of abbreviations

AFREA	Africa Renewable Energy Access programme
ASTAE	Asia Sustainable and Alternative Energy Programme
BIRU	*Biogas Rumah* (Biogas for households)
BMZ	German Federal Ministry for Economic Cooperation and Development *(Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung)*
BNPP	Bank Netherlands Partnership Programme
CO2	Carbon dioxide
EARP	Electricity Access and Roll-out Programme (Rwanda)
EnDev	Energising Development
ESCO	Energy Service Company
ESMAP	Energy Sector Management Assistance Programme
EU	European Union
EUR	Euro
EWSA	Energy, Water and Sanitation Authority (Rwanda)
FAFASO	*Foyers Améliorés au Burkina Faso*
FMO	Dutch Entrepreneurial Development Bank *(Financierings-Maatschappij voor Ontwikkelingslanden)*
FRES	Foundation Rural Energy Services
GIZ	*Gesellschaft für Internationale Zusammenarbeit*
HIVOS	Humanitarian Institute for Development Cooperation *(Humanistisch Instituut voor Ontwikkelingssamenwerking)*
IFC	International Finance Corporation (World Bank)
IOB	Policy and Operations Evaluation Department of the Ministry of Foreign Affairs of the Netherlands *(Inspectie Ontwikkelingssamenwerking en Beleidsevaluatie)*
ISS	International Institute of Social Studies
LPG	Liquefied Petroleum Gas
MDGs	Millennium Development Goals
MININFRA	Ministry of Infrastructure (Rwanda)
NDBP	National Domestic Biogas Programme
NGO	Non-Governmental Organisation
NIPP	Netherlands IFC Partnership Programme
ODA	Official Development Assistance
Pico PV	small Photovoltaic; solar energy devices
PNPM	*Program Nasional Pemberdayaan Masyarakat* (National programme for enhancing local communities in Indonesia)
PPP	public-private partnership
PREP	Promoting Renewable Energy Programme
PV	Photovoltaic
RVO	Netherlands Enterprise Agency *(Rijksdienst voor Ondernemend Nederland*
RWI	Rheinisch-Westfälisches Institut für Wirtschaftsforschung
SE4All	Sustainable Energy for All initiative

SNV	Netherlands Development Organisation
SREP	Scaling-up Renewable Energy Programme
ToR	Terms of Reference
USD	United States Dollar
UNDP	United Nations Development Programme

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Introduction to the evaluation

Since the late 1960s, Dutch development cooperation has paid attention to renewable sources of energy. Initially this coincided with the rise of small scale technologies, such as photovoltaic solar panels. Subsequently, it became linked to environmental concerns. Later, in the 1990s, the relation between poverty alleviation and renewable energy in developing countries became more visible. In 2004, the minister for Development Cooperation formulated an output target of providing 10 million people in developing countries access to all forms of energy by 2015.

Between 2004 and 2008, the Ministry of Foreign Affairs spent less than EUR 20 million annually on the operationalisation of its energy policy in the area of development cooperation. However, for the years 2008–2011 the minister for Development Cooperation announced an input of EUR 500 million for renewable energy programmes in developing countries through the 'Promoting Renewable Energy Programme' (PREP). In 2008, an evaluation of this renewable energy policy was announced. The Policy and Operations Evaluation Department of the Ministry of Foreign Affairs (IOB) took on this task and set up the design of the evaluation, as will be described below.

1.1 Purpose of the evaluation and evaluation questions

The policy review serves a dual purpose: to account for the investments in renewable energy in developing countries by the Dutch Ministry of Foreign Affairs and to identify lessons for future policy development and implementation in the field of renewable energy and development cooperation. It provides insight into policy implementation in the period 2004–2014, the policy instruments used, their effects on the income and expenditure, well-being and environment of households and communities in developing countries.

The following research questions were formulated:

1. What were the Ministry's underlying rationale and objectives for promoting renewable energy in developing countries?
2. What approach did it follow to implement the policy?
3. How effective has its support been in providing access to renewable energy, in influencing policy of partners responsible for investing in renewable energy, and in developing capacity of recipient actors on renewable energy?
4. What has been the impact of the interventions on household income and expenditure, well-being and the environment?
5. To what extent has the support been efficient?
6. How sustainable have the interventions been?

1.2 Organisation of the evaluation

Willem Cornelissen (ERBS, Erasmus University Rotterdam) and Rafaëla Feddes (IOB) conducted this policy review, on the basis of a systematic literature review and two qualitative studies, all conducted by IOB. IOB commissioned 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 to conduct eight impact evaluations of renewable energy projects in Rwanda, Burkina Faso and Indonesia, all of which have been published. These underlying studies were used as input for this policy review. References can be found in Annex 2.

To monitor the quality of its evaluation process, IOB appointed a reference group consisting of (external) experts: Pieter van Beukering (Institute for Environmental Studies, VU University of Amsterdam), Ronald Goldberg (Ministry of Foreign Affairs), Marcel Raats and Frank van der Vleuten (both Netherlands Enterprise Agency – RVO). IOB peer reviewers Antonie de Kemp, Piet de Lange and Ferko Bodnár also contributed to the quality of the report.

Special thanks go to others who have contributed to this evaluation: employees of national governments, local organisations, enterprises and Dutch embassy staff in Burkina Faso, Indonesia and Rwanda, the Gesellschaft für Internationale Zusammenarbeit, SNV, RVO (the Netherlands Enterprise Agency) and, last but not least, the 4,700 households and participants from the focus groups who were interviewed.

1.3 Methodology

The policy review was organised in four stages, contributing to:

- a systematic literature review based on the scholarly and scientific literature on the relation between renewable energy and development;
- a policy description and intervention logic;
- impact evaluations to measure the results of renewable energy interventions funded by the PREP;
- a final analysis.

1.3.1 Systematic literature review

To ascertain current knowledge on the impact of renewable energy interventions, IOB had already earlier carried out a systematic literature review (using the Campbell Collaboration protocol)[1] of the links between renewable energy and socio-economic development. This also served as a benchmark for IOB's own evaluation findings, which were published in Renewable energy: Access and impact (IOB, 2013).

1.3.2 Policy reconstruction

Dutch policy on renewable energy has been analysed on the basis of public policy documents sent to Parliament, internal policy documents and other information.[2] Moreover, interviews were held with present and past policy makers from the Ministry of

[1] Guiding Principles for the Methods Group of the Campbell Collaboration (2002). www.campbellcollaboration.org.

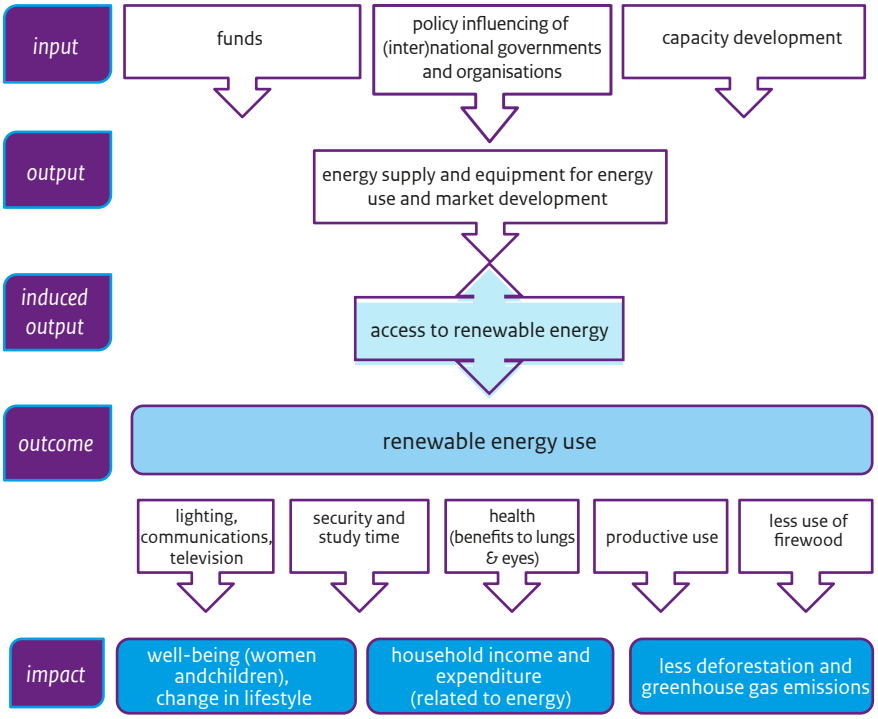
[2] MAXQDA software was used for the policy analysis.

Foreign Affairs, World Bank, Dutch and foreign enterprises and with scientists and other experts working in the field of renewable energy in developing countries.

1.3.3 Impact evaluations

Overarching Terms of Reference were formulated in October 2009 for a series of impact evaluations that focused on direct investments for providing access to energy. The intention was to determine the nature and sustainability of the impact on the living conditions of groups targeted by Dutch-supported energy interventions. Figure 1 shows a results chain summarising the output intended to be produced by the input (the latter was usually funding, technical knowledge and legal frameworks), and subsequently the anticipated outcomes and impacts.

Figure 1 *Results chain for renewable energy*



The programmes selected for evaluation were not representative of those funded by the PREP budget, since the amount of funding was not criteria for the selection. Instead, the programmes were selected with the aim of obtaining a range of types of energy sources, utilisation techniques and national and international organisations implementing these, as well as the opportunities these programmes offered the IOB evaluators to apply distinctive (quasi) experimental methods.

Eight rigorous impact evaluations were all designed on the basis of 'mixed methods', i.e. the application of both qualitative and quantitative techniques. *Qualitative* methods were used to analyse the context of the interventions, to describe the components of each programme/project funded by the PREP, to analyse its (institutional) sustainability, to capture potentially unintended impacts and to validate the results of the quantitative research. *Quantitative* techniques were used to measure the relationship between intervention and effect variables, and the contribution of each intervention to the observed effects, while controlling for other factors that might have influenced the selected effect variables. Existing statistical data (e.g. household surveys, demographic and health surveys, administrative data) were used, in addition to baseline surveys for primary data collection.

In order to avoid any unobserved factors, which could have skewed the results, it is important to make a comparison with a counterfactual situation. This requires a control group in addition to the treatment group. The different techniques applied in the ten studies that underlie the present report (two qualitative and eight rigorous impact evaluations) are summarised in Table 1.

Table 1 Overview of programmes evaluated and research methods

Programme Project	Type of energy	Implementing organisation	Target group	Method
Improved cooking stoves, urban context, two main cities, Burkina Faso	Cooking energy	GIZ – FAFASO	Town dwellers, lower income groups	Mixed method: cross sectional method with propensity score matching + focus group discussions
Improved stoves for local breweries, nationwide, Burkina Faso	Cooking energy	GIZ – FAFASO	Breweries of local beer	Mixed method: difference-in-difference method + focus group discussions
Solar energy rural households, health centres, schools in Burkina Faso	Solar energy based on fee-for-services	PPP with NUON, FRES and Yeelen Ba	Rural communities in Western Burkina Faso	Mixed method: Cross sectional method with propensity score matching. Partly difference-in-difference method based on existing baseline + qualitative + focus group discussions
National Domestic Biogas Programme (NDBP), Rwanda	Cooking energy	HIVOS, SNV	Rural communities,	Mixed method: Cross sectional method + focus group discussion
Micro hydro electricity generation or rural communities, health and educational centres, Indonesia	Small hydro- power installa-tions	GIZ and World Bank	Rural communities in remote areas	Mixed method: difference-in-differencs + qualitative at community level

Table 1	Overview of programmes evaluated and research methods			
Programme Project	**Type of energy**	**Implementing organisation**	**Target group**	**Method**
Policy support to the development of geothermal energy, Indonesia	Geothermal energy	Planning department Indonesia, Netherlands Enterprise Agency, International Finance Corporation	Government Indonesia, focus on sub-national level	Qualitative (extended web search + interviews)
Electricity Access Roll-out Programme for rural households, health centres and schools, Rwanda (grid electricity)	Grid electricity	National government (MININFRA) through EWSA utility company	National programme, urban and rural	Mixed method. Pipeline (non-randomized) difference-in- difference method + focus group discussion + additional research among productive users (survey and qualitative studies) + full census among health centres.
National Domestic Biogas Programme (BIRU), Indonesia	Cooking energy	Ministry of Energy and Natural Resources. Technical assistance from SNV and HIVOS	Focus on rural areas and dairy cooperatives	Mixed method: difference-in-difference + propensity score matching, combined with pipeline cross sectional method + focus group discussion
Solar energy for rural households, Rwanda	Personal Solar Lighting; pico-PV lamps	ToughStuff Int. Implementing agency of the Daey Ouwens Fund: RVO	Focus on remote rural areas	Mixed method: Randomized Controlled Trial + qualitative interviews
Sustainable Energy Development project (capacity development), Rwanda	Energy in general	World Bank Rwanda through EWSA	National, institutional support	Qualitative (semi-structured interviews) + observation

2

Context

2.1 International context

In 1992, world leaders meeting at the Earth Summit in Rio de Janeiro agreed on a road map for sustainable development of the global society. This road map singled out Economic development and investment as important elements for achieving a sustainable future, as well as reducing greenhouse gas emissions, increasing resource efficiency and improving human well-being and social inclusion. Although clean energy is increasingly available to the world's population, still a large proportion of the population in some of the world's poorest countries are unable to access modern energy services. About 40 percent of the global population relies on traditional use of biomass or manure for cooking (i.e. three-stone fire and unimproved stoves) and heating, and on kerosene wick lamps, batteries and candles for lighting. There are 1.3 billion people without access to electricity, of whom 600 million in Africa. The largest concentrations of the 'energy poor', i.e. people who are both poor and who lack access to modern forms of energy, are found in the rural areas of sub-Saharan Africa and South Asia (Modi, McDade, Lallement and Saghir, *Energy services for the millenium development goals*, 2005).

To achieve the MDGs, the international community adopted a plan of implementation at the World Summit on Sustainable Development (2002) and agreed to increase efforts to provide people all over the planet (especially the poor) with reliable and affordable energy services.

At international level, the initial emphasis on the relation between energy and poverty shifted to the relation between energy and climate. Access to energy is considered a prerequisite for socio-economic development, but the use of energy from fossil fuels is also related to worldwide problems such as climate change. Worldwide energy use is responsible for two-thirds of all man-made greenhouse gas emissions. Therefore, at the core of sustainable development lies the use of renewable energy sources. More attention has been paid to this correlation since the United Nations Climate Change Conference in Copenhagen in 2009, at which the content of a new climate agreement was discussed and measurable targets were introduced to reduce the global greenhouse gas emissions to the level of 2006 by 2020. Subsequently, the exchange of knowledge on renewable energy has been reinforced by establishing specialist institutes, such as the UN-Energy knowledge network, and the International Renewable Energy Agency (IRENA, 2009)[3]. The International Energy Agency reports yearly about the state of affairs on energy.

Reaching the MDGs is thought to be dependent on access to energy, including renewable energy. For this reason, the United Nations proclaimed 2012 the International Year of Sustainable Energy for All, while the General Assembly of the United Nations declared the current decade the *Decade of Sustainable Energy*.

[3] IRENA is an inter-governmental organisation that helps other countries in their transition process to the use of renewable energy. More than 100 countries and organisations have joined the network as a member.

Dutch policy on renewable energy deliberately refers to global challenges such as poverty reduction and global warming. Therefore, it cannot be separated from global efforts such as the MDGs and climate agreements.

2.2 Dutch renewable energy policy in the field of development cooperation

The conference 'Energy for Development' (2004) hosted by the Dutch minister for Development Cooperation and the state secretary for Environment with support from the World Bank, UNDP and the World Business Council for Sustainable Development was organised as a follow-up to the World Summit on Sustainable Development 2002. It marked an important change. The Netherlands expressed its keen interest in funding affordable and socially acceptable techniques for the provision of modern and clean energy services to poor people. The then Dutch minister for Development Cooperation announced the government's commitment to facilitate access to modern energy to 10 million people in developing countries by 2015, with the aim of reaching the MDGs in 2015. She noted that this would stimulate sustainable economic growth and poverty reduction (Ministry of Foreign Affairs, 2003, 2006b). This target concerned all forms of energy (Ministry of Foreign Affairs, 2004, p. 5) because the decisive factor was the cost effectiveness of technological options for providing access, including fossil fuels (Ministry of Foreign Affairs, 2006b). During the 2006 international Energy Week the Dutch Minister for Development Cooperation presented the proposal 'Energy for All', in which an explicit objective was to include access to energy services for the poor, especially for those living in Sub-Saharan Africa (Ministry of Foreign Affairs, 2006b).

2.2.1 Promoting Renewable Energy Programme

In 2007, the Dutch government listed energy as one of its policy priorities for development cooperation (Ministry of Foreign Affairs, 2007). Poverty reduction, sustainability, climate and energy were considered to be interlinked. The Minister for Development Cooperation announced an input of EUR 500 million for *renewable energy* in developing countries for the years 2008–2011, through the 'Promoting Renewable Energy Programme' (PREP). The ultimate goal of this investment was to contribute to poverty reduction and gender equality, and to mitigate the negative effects of energy use on the climate (Ministry of Foreign Affairs, 2008). Access to energy for the poorer communities needed to be affordable and linked to increasing the proportion of renewable energy sources in the total global use of energy. This should be achieved by supporting governments in developing countries to collaborate with public and private organisations on implementing 'good and coherent' renewable energy policies. Taking advantage of active channels of implementation, using existing capacity and knowledge, and enabling developing countries' governments were at the core of this Dutch approach.

The PREP encompasses four intervention areas: (i) production of and access to renewable energy; (ii) sustainable production of biomass for energy purposes; (iii) influencing the policy

of partners in the energy sector towards renewable energy; and (iv) capacity development in developing countries. To be eligible for PREP funding, a programme's design had to meet certain requirements: (i) the geographical focus of the PREP programme would be on Indonesia and Sub-Saharan Africa, in particular on the post-conflict region around the African Great Lakes, since the minister for Development Cooperation had identified this region as one of the areas with the highest potential for sustainable energy management; (ii) the funding should be used for upscaling existing interventions that made use of proven technologies; and (iii) interventions should be implemented by well-known partners with a solid track record in the energy sector.

Between 2004 and 2008 the renewable energy policy was formulated largely from a poverty reduction perspective (achieving the MDGs), on the assumption that giving poorer communities access to energy would increase their income and well-being. This assumption still held in 2008, but by then the Dutch government had also added the aspirations of achieving a sustainable environment and mitigating climate change, especially in relation to energy. Consequently, Dutch policy on renewable energy was underpinned by two different perspectives: access to renewable energy to reduce poverty and, simultaneously, access to renewable energy to mitigate the effects of energy use on climate. Global warming had become – and still remains – a common concern, whose causes of which the impact can be mitigated by reducing the use of fossil fuels and by promoting access to renewable energy. However, individuals cannot always obtain such access; often they rely on assistance from the public sector. The Dutch government aimed at enhancing sustainable energy and biomass programmes in developing countries and at concomitantly reducing their reliance on fossil fuels. It assumed that the World Bank and private sector organisations would invest in renewable energy. To boost private investment, the Dutch government argued that in a first stage, both national governments and donors had to invest (Ministry of Foreign Affairs, 2008).

The policy changes introduced after a new government took office in 2010 implied a lower profile for energy in development cooperation and a reduction in funding of renewable energy-related development projects (Ministry of Foreign Affairs, 2010, 2011). Ongoing programmes were to be ended no later than 2015. Since climate change had become a priority, the focus of renewable energy shifted from poverty reduction to climate mitigation. In 2013 renewable energy became part of Dutch climate policy (Ministry of Foreign Affairs, 2013). Today, Dutch policy on development cooperation considers climate as one of the major so-called 'global public goods'.

Dutch policy on renewable energy is relevant from both a poverty reduction perspective and a climate mitigation perspective, but a single intervention cannot serve both objectives at the same time. Interventions have not been modified in light of this policy change. For example, with regard to climate change, it would have made more sense to reduce interventions focusing on energy for cooking in rural areas and to increase access to renewable forms of electricity in towns and villages, as this would have had more impact (see the results presented in Chapter 4).

3

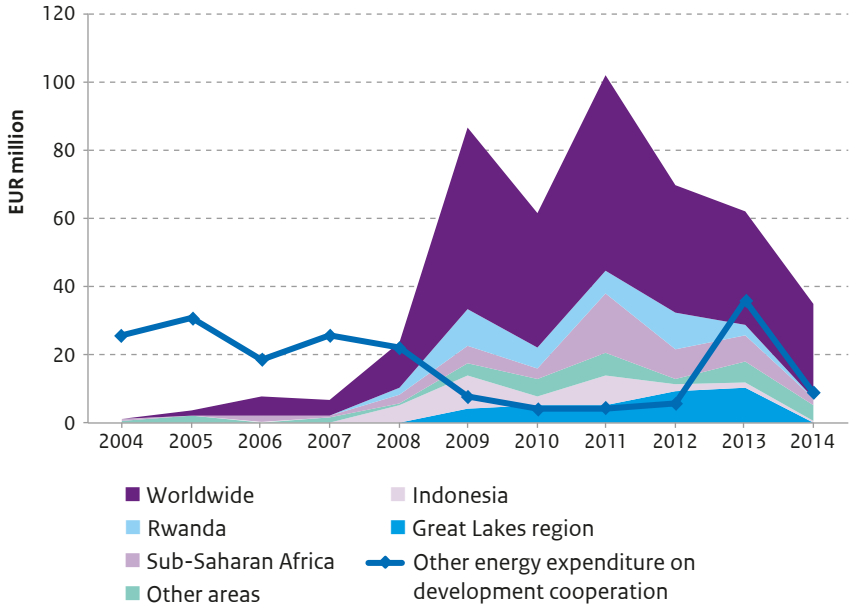
Policy implementation

3.1 Financial contribution

The Dutch government's ambition to promote access to renewable energy in developing countries (Ministry of Foreign Affairs, 2007) is reflected by the EUR 500 million injected into the PREP (EUR 125 million from the regular DGIS budget plus an additional EUR 375 million). This was over and above the Official Development Assistance (ODA) target of 0.7% of the Dutch GNP and 0.1% of the GNP for environment. During the period 2004–2014, 27 implementing agencies[4] were responsible for the realisation of 43 programmes and projects, accounting for a total of EUR 459 million. The German *Gesellschaft für Internationale Zusammenarbeit* (GIZ) and the World Bank together were responsible for over 40% of the disbursements, i.e. for EUR 195 million. Programmes and projects were not selected on the basis of fixed eligibility criteria. Moreover, spending pressure played a role, as did inter-ministerial agreements on the use of biomass.

Total Dutch expenditure on energy in developing countries (i.e. PREP and expenditure related to non-renewable energy) between 2004 and 2014 was EUR 648.6 million. The PREP component comprised 70%, i.e. EUR 42 million per year, equalling 1% of the total Dutch ODA. Figure 2 gives an overview of the annual expenditure on energy-related interventions in developing countries during the period 2004–2014.

Figure 2 *Annual expenditure by the Dutch government on PREP and other energy-related activities, 2004–2014*

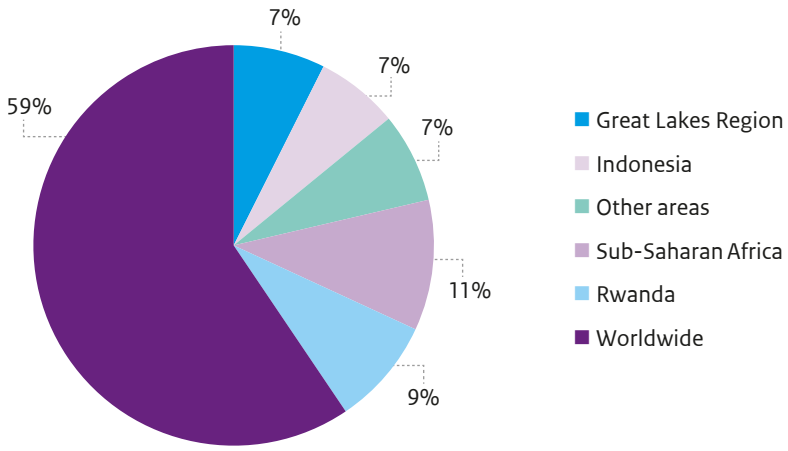


[4] Excluding organisations and enterprises who implemented projects that were part of the Daey Ouwens Fund.

The category 'other expenditure on energy in development cooperation' shows a decline between 2008–2012, followed by an increase in 2013 and then a fall to just above the 2012 level. The increase reflects growing political interest in the climate change agenda.

Figure 3 shows the expenditure per priority area. One-third of the total expenditure went to Indonesia, Rwanda and the Great Lakes region. The Netherlands supported the energy sectors in Indonesia and Rwanda as part of the bilateral programme (IOB, 2014). The category 'Sub-Saharan Africa' encompasses programmes that could not be ascribed to a specific Sub-Saharan African country, such as the African Biogas Partnership Programme (11%). The largest share of the budget, i.e. 59%, falls in the 'worldwide' category. These are programmes covering interventions at a global scale or in a larger number of countries, as was the case with the Energising Development (EnDev) programme or the Scaling-Up Renewable Energy Programme (SREP). The category 'other areas' includes interventions in Mozambique, Mongolia, Uganda and Zambia.

Figure 3 *Total expenditure on renewable energy by geographical region, in %, 2004–2014*



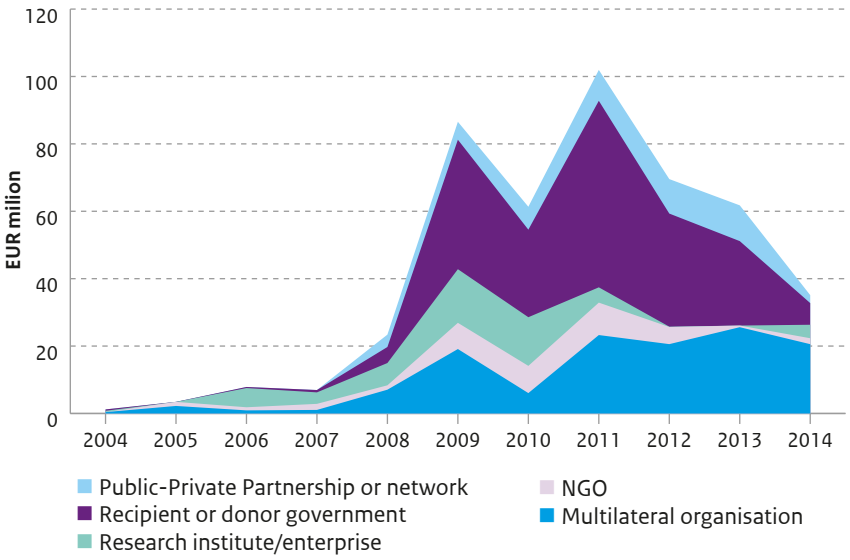
It is difficult to classify expenditure according to the four intervention areas of the PREP because these areas are not mutually exclusive. However, most interventions – about EUR 348 million (or 76% of the total expenditure of the PREP) – were entirely or partially about the production of and access to renewable energy. A further EUR 185 million was used for influencing policy-making, and another EUR 97 million for sustainable biomass production.

The period 2004–2008 was characterised by sector-wide cooperation delegated to Germany through the EnDev programme (which will be explained in more detail in paragraph 3.2). The injection of EUR 500 million was an incentive to change this modus operandi because GIZ did not have sufficient implementing capacity. In addition, the aspiration to influence the policies of important implementing partners in the energy sector motivated the Ministry also to collaborate with more partners than GIZ alone. When PREP started, the

Ministry centralised programme management to prevent embassies from incurring management transaction costs. Experts on short-term contracts supported headquarters staff responsible for implementation of the PREP.

Figure 4 below shows that the largest share of the budget was spent on bilateral partners. The peaks in 2009 and 2011 are attributable to the disbursements to the EnDev programme (accounting for 16% of the total disbursements). A quarter of the expenditure was made available to multilateral organisations, such as the World Bank. In the period 2004–2014 the PREP activities were implemented by over 30 organisations that in the figure have been grouped into five categories.

Figure 4 *Annual expenditure by the Ministry broken down into five categories*



3.2 Collaboration

Outsourcing the implementation of the PREP implied that the Ministry had to select competent implementing agencies. Its choice was mostly based on: i) the agency's knowledge of and experience in the sector; ii) the agency's capacity to upscale implementation; iii) positive experience with the agency. Important partners were GIZ, the World Bank, RVO and the Dutch development bank FMO. There were no standard criteria for determining the budget to be allocated per partner. However, decisive factors seem to have been used regarding whether the organisation in question had sufficient implementing capacity and leverage, or whether it would be strategically advantageous to involve third parties. Multilateral organisations were the most suitable in terms of leverage.

3.2.1 Cooperation with Germany

Given the output target set of providing 10 million people with access to energy and given the Ministry's lack of experience and expertise in the energy sector, implementation of the programme was left to third parties. In line with its development paradigm of taking a sector-wide approach and harmonisation[5], the Netherlands Directorate General for International Cooperation (DGIS) approached GIZ to propose a single-sector delegated cooperation programme. An implementation agreement was signed in 2005. The resulting EnDev programme[6] was the world's first sector-specific delegated cooperation at global level[7] and the first donor-supported programme that set a quantified outcome target at international level. The EnDev-supported energy technologies are solar energy in various forms (small off-grid systems, solar systems, productive use, water heating), hydro energy (pico, micro and small-scale electricity generation), biogas, electricity grid extension and improved cooking stoves.

At its start in 2005, the features of EnDev were that the Dutch government granted EUR 60 million for a four-year period, while the German government made the implementation infrastructure available and provided additional financial resources for activities in certain countries. The programme was to be deemed successful if 3.1 million persons were given access to modern energy services in a sustainable way; 60–80% of the resources were to be earmarked for activities in Africa. At the end of the first phase (2008, extended to 2009), EnDev had grown to 23 programmes implemented in 22 countries[8].

Since 2005, EnDev has been developing new markets for pro-poor energy access and upscaling successful programmes with a broad spectrum of technologies and a variety of instruments. Its particular feature is a competition-based cost-efficiency benchmark approach for implementing the projects. In its quest to ensure sustainable energy solutions, EnDev considers it essential to provide energy technologies at a price affordable by the target population. It also strives to keep the programme costs relatively low, i.e. below EUR 20 per beneficiary. The introduction of these technologies is market-driven, so the solutions may differ from country to country. EnDev projects implement additional components, such as awareness-raising campaigns, vocational training and assisting entrepreneurs to start energy-related businesses. GIZ contracted RVO for the monitoring and for providing general advisory services.

5 Donor countries coordinate and simplify procedures and share information to avoid duplication (OECD/DAC).

6 Since 2012, the name 'Energising Development' has also been used by the European Commission for its initiative to provide access to sustainable energy for an additional 500 million people in developing countries by 2030 as a European Union (EU) commitment within the framework of the UN Sustainable Energy for All Initiative (SE4All). President José Manuel Barroso at the EU Sustainable Energy for All Summit in Brussels, April 2012.

7 In 2009, the partnership between the Netherlands' Ministry of Foreign Affairs and GIZ was replaced by one between the Netherlands' ministry and the *German Bundesministerium für wirtschaftliche Zusammenarbeitung und Entwicklung* (BMZ).

8 The precise number of countries varies from year to year. In 2013 EnDev was being implemented in 18 countries: Bangladesh, Benin, Bolivia, Burkina Faso, Burundi, Ethiopia, Ghana, Honduras, Indonesia, Kenya, Mali, Mozambique, Nepal, Nicaragua, Peru, Rwanda, Senegal and Uganda.

The PREP also encompassed the EnDev 2 Partnership Agreement for the period 2009–2012 (later extended to 2013) with the *Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung* – BMZ)[9], but operationalised through GIZ. EnDev 2 anticipated that an additional 3 million people would benefit. Initially, EnDev 2 was funded by DGIS and BMZ, but over time other donors and financiers joined in (i.e. the Norwegian Ministry of Foreign Affairs; the Australian Agency for International Development; the UK Department for International Development; and the Swiss Agency for Development and Cooperation). Additional contributions to country projects were made by the ACP-EU Energy Facility and Irish Aid. By 2013, the total budget amounted to EUR 185.8 million. EnDev is scheduled to run until December 2018.

3.2.2 Cooperation with World Bank

Since 1998, the Bank Netherlands Partnership Programme (BNPP) has been the Ministry's main financial instrument (for activities that are not country-specific) to influence World Bank policy (for example, to become more active in areas such as gender and good governance). In addition, the BNPP enabled the Netherlands to accommodate projects and programmes that were too extensive from a financial or managerial perspective. At first it was intended to allocate as much of the PREP resources as possible to the BNPP to get the greatest possible leverage and to limit the managerial costs. In the period 2009–2013 the core programme of BNPP targeted the funding of analytical studies, but energy programmes such as Energy Sector Management Assistance Program (ESMAP) also fell under the umbrella of BNPP. As part of the budget cuts announced in 2011, the Ministry decided to cease funding for the BNPP and allow it to run down.

At the request of the G8 Summit in Gleneagles (2005) the World Bank developed an investment framework for clean energy in the context of global warming: the so-called Comprehensive Framework for Investment in Climate Change, Clean Energy and Sustainable Development. The Netherlands welcomed this initiative, but felt that the framework should pay more attention to energy access for poorer populations. Four arguments in favour of working with the World Bank on energy were put forward in 2008:

(i) certain large World Bank programmes (including ESMAP) could serve as the basis for the scale-up and roll-out of activities, particularly in Sub-Saharan Africa;
(ii) there was the possibility to include an explicit objective to generate access to energy for the poor, especially in Sub-Saharan Africa that fitted in with the aims of the Energy for All initiative (2006);[10]
(iii) the chance to create a leverage effect was considerable given the World Bank's credit portfolio on energy. Via loans, influence could also be exerted on national governments; and
(iv) the World Bank had extensive knowledge about energy programmes and a comprehensive evaluation of these was in progress (Ministry of Foreign Affairs, 2008)

[9] BMZ is the leading partner in this worldwide programme, with the Netherlands initially the 'silent partner'. After more financing partners joined in, the organisational structure changed to a Board comprising the main financing partners, with the Netherlands and Germany as 'executive entity

[10] This was approved during the annual general meeting of the World Bank, where it was decided that a framework for investment in energy in Africa would be created (Ministry of Foreign Affairs and the Ministry for Housing, Spatial Planning and the Environment, 2006).

The Ministry underlined the importance of channelling resources through multilateral institutions to promote coherence on a global scale, reduce fragmentation and to secure global public goods (Ministry of Foreign Affairs, 2009). The World Bank was interested in collaborating with the Netherlands, partly because of the delegated cooperation with Germany and partly also because the BNPP and existing Dutch programmes in the field of energy, such as ESMAP and the Asia Sustainable and Alternative Energy Program (ASTAE) had given the Netherlands a good reputation.

Most of the World Bank activities funded by the Netherlands were upstream activities, i.e. focused on improving an enabling environment for investments in renewable energy, in particular via policy development, capacity building, regulation, certification and disclosure of information targeting renewable energy infrastructure. Later on the World Bank offered the opportunity to link renewable energy to climate funds being managed by the World Bank. The World Bank saw renewable energy as the linking pin between the poverty reduction focus and climate mitigation.

Within the PREP, the Netherlands supported five large programmes that were centrally funded by the World Bank and IFC: SREP, the ASTAE programme, the Netherlands IFC Partnership Programme-Renewable Energy (NIPP-RE), the ESMAP Programme and the related Africa Renewable Energy Access and Scale-up Programme (AFREA).

PREP is actually an assemblage of sub-funds, programmes, projects and activities. The Ministry's implementation strategy was to work through existing channels, making use of a broad spectrum of actors in energy. Hence the vast majority of funds were either delegated or outsourced to third parties. The PREP funds have enabled energy-related activities in over 30 countries, but have focused mostly on Indonesia and the African Great Lakes region. Besides outsourcing and delegating funds to third parties, the Dutch modus operandi is also characterised by efforts to influence the policy of important institutional actors in the energy sector through policy dialogue.

4

Effectiveness

4.1 Access to renewable energy

The target set by the Dutch policy in 2004 to provide access to modern energy for 10 million people in developing countries was achieved in 2011. In 2013 more than 14 million people had access to renewable energy, meaning that the Dutch commitment had been exceeded by 40%. An important contributor to these results was the EnDev programme. About 80% of the output realised can be attributed to this programme. Definitions and counting methods were developed and recorded in 2006.[11] On the basis of the actual number of registered beneficiaries and after correcting for double counting, unsustainable use and other errors, the adjusted net result was 9.7 million persons connected to modern energy in 2011, of whom 3.3 million were connected to electricity and 6.4 million to modern cooking technologies (Loo, 2012).[12]

Offering 'access to energy' is a broad concept, ranging from providing a household with a solar lamp to connecting a household to the electricity grid. The Sustainable Energy for All Global Tracking Framework (2013, p. 79) distinguished five levels (or tiers) of electricity services: see Table 2.

Table 2 Levels of electricity services

Tier	Description
5	Use of devices that typically require several kilowatts, such as air conditioners, industrial equipment
4	Use of devices that typically require one kilowatt, such as water heaters, irons, vacuum cleaners. At this level domestic solar systems are usually no longer sufficient
3	Use of devices that typically require 100 W or more, such as rice cookers, refrigerators, freezers
2	Bright light, use of radio and telephone and other devices requiring several tens of watts, such as small televisions, fans, or computers
1	Pico-PV and battery charging stations

Source: Sustainable Energy for All Global Tracking Framework, 2013. (www.SE4all.org).

Since at the time the Dutch system for compiling result figures was still being designed, the distinction made in Table 1 had not yet been published and so the output figures exclude the tier 1 energy supply. In the impact studies, access to renewable energy encompasses improved cooking stoves, biogas digesters, home solar systems / lighting (tiers 1, 2 and 3), the roll-out of an electricity network (tier 5), geothermal energy, micro hydro energy (tier 4) and some general capacity development.

The impact studies examined the results of several Dutch-funded interventions in terms of the number of persons given access to various forms of energy. In Burkina Faso, 9.6% of the urban population were given access to improved cooking stoves; in Indonesia, the construction of micro hydropower plants provided electricity to 18,000 households, while

[11] Framework for output target energy. DMW and FEZ, 4 April, 2006.
[12] This excludes access to energy for schools and health centres.

the roll-out of the power grid in Rwanda connected 360,000 households. In contrast, in Rwanda the provision of solar lighting[13] or biogas digesters[14] reached only a limited number of households. Having access to energy does not automatically imply that people actually use it. In Burkina Faso, for instance, some households considered the improved cooking stove to be too beautiful for daily use; another example is that households physically connected to the electricity grid may lack the resources to pay the connection fee, or to pay for light bulbs and wiring, or even to consume electricity.

4.2 Use of renewable energy

People have particular reasons for (not) using the energy to which they have access. The prime factor determining potential usage is physical access to a specific source; the second factor is the cost to the user. What determines the potential use is not the price of a device (since that can be subsidised, or credit can be obtained) but rather the actual cash lay-out that is required. For example, farmers in Rwanda have to contribute EUR 300 (in cash) to purchase a biogas digester (which actually costs double that amount), whereas farmers in Indonesia (members of a milk cooperative) need hardly any cash, since the cooperative buys on their behalf and recoups the costs by deducting these from the price paid to the farmer for the milk supplied to the cooperative. Social and cultural factors may also play a role in energy usage, such as the degree to which the type of energy (or a particular device) meets an aspired level of comfort or urban life style. And use may be determined by traditions and decision making at the community level: it seems that women decide about energy if it concerns the cooking environment, given that they are affected most by 'dirty' fuels and air pollution when preparing food, but it is mostly the male household member who finally decides if a type of energy will be used by the household.

Programmes and subsidies for renewable energy in developing countries mostly focus on the poorer strata in society. However, these population groups are usually not the first to change to other types of energy or start using other energy devices. Households with a higher income in rural areas, such as those of teachers, police officers and medical staff, are more likely to adopt new sources or to switch to other sources. Environmental awareness or arguments about climate change do not play a role in their decision making.

With the exception of improved cooking stoves, the smaller interventions (biogas, solar lamps, home solar systems) have not contributed to access to energy as envisaged, at least in terms of numbers. However, among the households that acquired these devices, the usage rate is high (90% or more). In the case of rural electrification schemes in Indonesia, almost all households use the electricity from the micro hydropower installations (but households do not have an individual electricity meter). In Rwanda 20-30% of the households that have been connected lack the financial means to use the power.

[13] Only 2% of the intended output had been reached when the company that was financially supported by the programme went bankrupt.

[14] Only 12% of the expected output was realised, i.e. 1,800 digesters were installed, benefitting 9,000 people.

Although a household may start using a more modern form of energy (renewable or otherwise), there is no guarantee that it will continue doing so. It depends, among other things, on overall satisfaction with the energy source or device. Satisfaction was measured in the eight impact evaluations by using a 'willingness to pay – willingness to let' analysis. This revealed a high to very high level of satisfaction (above 90%), except for biogas digesters in Rwanda, where only 64% of users were satisfied with the devices.

4.3 Policy influencing

One of the four intervention areas of the PREP programme was to influence the policy of the development partners involved in energy investments. The Dutch strategy was to convince these partners of the importance of renewable energy for sustainable development through dialogue, in combination with making ample funds available for investment.

Through its Energy for All initiative, the Netherlands enhanced international awareness of access to energy services in developing countries. PREP enabled the minister to extend his lobby and advocacy for renewable energy. In addition to focusing on bodies such as the FMO, the European Commission and the United Nations, the Ministry focused considerably on the World Bank. The Bank was considered to be an important and influential actor with substantial implementation capacity in the global energy sector. Furthermore, the Bank was already implementing several programmes and the Netherlands had an Executive Director and its own representative at the Bank. The relation with the World Bank was thus smooth and constructive.

Several changes that have taken place in the World Bank energy policy can be related to the Dutch efforts. Within ESMAP, which evolved towards a think-tank, the Netherlands emphasised that access to renewable energy and the involvement of the private sector can strengthen each other, thereby abandoning the paradigm that renewable energy could only be sustained with public sector subsidies. ESMAP incorporated this view in its advice to governments that enquired about options for funding at the World Bank. The incorporation of this view in the World Bank's advice can be attributed to the Dutch influence.

The World Bank's energy group concerned with Africa (AFTEG) used to focus on large-scale energy infrastructure. In 2009, the Netherlands proposed launching AFREA through a EUR 24 million contribution, grouping several existing initiatives for energy programmes at household level in Africa, such as home solar systems and improved cooking stoves. Since the launch of AFREA, AFTEG has been receptive to these types of small-scale interventions. In turn, AFREA is now the main contributor to Lighting Africa, an innovative initiative that promotes initiatives for quality solar energy.

SREP can also be considered a Dutch initiative that has been added as a separate niche within the Climate Investment Fund. It was a response to the Ministry's concern that the Climate Funds would not reach developing countries but instead would benefit large

emerging markets with big populations, such as India and China. However, launching a new programme within the World Bank required at least USD 300 million of starting capital. The Ministry provided an ample EUR 50 million and successfully lobbied for funding from other donor countries to launch the programme.

The Bank's energy policy used to focus mainly on the cheapest energy source (mostly fossil fuels, such as carbon) in developing countries. However, the Ministry was able to convince the Bank to start promoting more sustainable energy forms and to make sure that the poorer countries could also benefit. The Bank acknowledged that renewable energy could be the link between the poverty reduction objective (MDGs) and the climate agenda for which it administered global funds (Climate Investment Funds).

The Netherlands has been one of the biggest donors for the ESMAP and ASTAE and was the founder of AFREA and SREP. Up until 2011, it was the single donor contributing to the AFREA I trust fund. This changed for AFREA II, when several other donors expressed interest in becoming involved. By means of ESMAP, ASTAE and AFREA, the World Bank was able to use these funds for its advisory services to recipient governments. In 2011, however, the Netherlands withdrew its investment as a result of a change in government priorities. This, in combination with the discontinuation of the BNPP in 2011, caused confusion among World Bank staff.

The Netherlands also influenced the policy of recipient countries, either indirectly through the multilateral institutions that provide policy advice to the governments of recipient countries, or directly by means of policy dialogue and funds, such as in Rwanda.

The Government of Rwanda (GoR) had requested the Netherlands to be present in the energy sector within the framework of the division of labour among the development partners. The Netherlands consented. In 2008, a Memorandum of Understanding was signed between the GoR and development partners for support to the energy sector, in particular to roll-out an electricity programme. The subscribing development partners would adhere to the principles of the Paris Declaration on aid effectiveness (2005), i.e. ownership, alignment, harmonisation, managing for results and mutual accountability. Although all development partners aligned with the GoR's policy, only the Netherlands also aligned its administrative and financial systems. The Dutch contributions influenced GoR's policies and practices, in particular in areas of Dutch interests, such as renewable energy, harmonised and simplified regulations in the woody biomass and charcoal chain, effective coordination institutions, and reliable reporting on progress from the Management Information System. The World Bank and the Netherlands suggested that the GoR prepare an 'Investment Prospectus' (Castalia Strategic Advisers 2009) for the Electricity Access Roll-out Programme (EARP), in order to attract additional funding. The Dutch up-front payment in the form of aligned pool funding had a catalytic effect, since it pulled in other financiers to implement EARP. Ultimately, the international donor support had reached approximately USD 338 million by 2013, with the Netherlands contributing EUR 30 million. As a result of the 2011 and 2013 changes in Dutch global policies on international cooperation, however, the energy sector was no longer eligible for Dutch funding. The GoR

saw this retreat as undesirable and in breach of the principles of the Accra Action Plan, but expressed its understanding.

In general, the Ministry actively pursued its policy and deployed human and financial resources to communicate the relevance of renewable energy and development in international energy fora. Internationally the Netherlands was considered a professional and committed supporter of renewable energy and was fairly successful in developing new programmes and funds aimed at Sub-Saharan Africa, i.e. AFREA and SREP. Given this track record and its leading role in energy, international partners and recipient countries alike were quite astonished by the policy changes and the budget reductions introduced in 2011.

4.4 Monitoring and evaluation

The Ministry of Foreign Affairs chose to outsource the implementation of the PREP (mostly the upscaling of existing activities) to well-known partners with experience in the field of renewable energy in developing countries. Consequently, internal managerial costs could be kept low and windows were opened for policy dialogue with partners, which in some cases resulted in effective policy influencing. Delegation also implied using implementation strategies, monitoring systems and administrative procedures of the partners that did not always coincide with Dutch policy and information needs. As an example, only 40% of the PREP budget was invested in the priority areas identified by the minister, i.e.Sub-Saharan Africa (in particular around the Great Lakes region, including Rwanda) and Indonesia.

The Ministry actively discussed with the World Bank the progress and results of certain activities such as AFREA and ESMAP in the context of the annual Coordination Group meetings in Washington. For example, the Netherlands emphasised that the monitoring reports of AFREA/ESMAP should be more precise about transformations achieved in the energy sector at country level, and about global investments and the capacity of recipient countries to manage these. The Netherlands contributed substantially to the monitoring and transparency of the Trust Fund activities, as evidenced by the launch of internet portals with information on all ongoing activities.

The implementation of the PREP programmes/projects did not always proceed smoothly. Three of the ten interventions scrutinised by IOB had serious problems: a) the Dutch financial contribution to the biogas project in Rwanda was discontinued during implementation as a result of a slow adoption rate; b) the implementation company that had received funds from the Daey Ouwens Fund to set up a distribution system for solar lamps and kits went bankrupt; and c) the collaboration with NUON and FRES for building a lease system for solar panels in Burkina Faso was discontinued.

It can be concluded that Dutch policy on energy in development cooperation has been effective in providing more than 14 million people with access to renewable energy and therefore has exceeded by 40% the Dutch commitment. The Ministry has also been effective in influencing the policy of partners involved in energy investments, in particular the World Bank. The Dutch strategy was to convince these partners about the importance of renewable energy for sustainable development, through dialogue in combination with ample funds for investment.

In conclusion, the Ministry chose to outsource policy implementation to partners who had experience in the energy sector. This modus operandi enabled the Ministry to limit the managerial costs and to better influence the policy of those partners towards renewable energy in developing countries. However, outsourcing also implied that the Ministry could not always enforce its own policy objectives, such as a focus on specific geographical priority areas, nor could it always get the information needed for its own accountability on performance and achievements.

5

Impact

The impact of the energy and development interventions on the living conditions of households and at community level has been measured. Three components can be distinguished: (i) income and expenditure; (ii) well-being and comfort; and (iii) environment and CO_2 emissions.

5.1 Savings on expenditure and gains in income

Cooking energy

Households that took part in the surveys use either biomass or modern energy sources such as petroleum or LPG for cooking. In Africa, the use of electricity for cooking is rare. Improved cooking stoves enable households to reduce the amount of fire wood or charcoal needed, but in practice, these savings were below what was technically feasible. For example, in Burkina Faso, households with improved, certified (*Roumdé*) cooking stoves reduced their expenditure on fire wood and charcoal by up to 20%, whereas under controlled (test) circumstances savings of 29-43% were possible. The difference can be explained by the so-called *rebound effect*, due to changes in human behaviour as a result of the innovation. The efficiency of the stove can be 'consumed' in two ways: either the household continues cooking the normal dishes and saves on fire wood (and hence expenditure, as was intended), or it cooks more dishes, different dishes and uses the energy also for other purposes that improve well-being and comfort, such as hot water for tea or washing (personal hygiene). In the latter case, the savings in fire wood use are less or even negligible.

In Burkina Faso, the effect of improved cooking stoves on income and savings has also been measured for beer (dolo) breweries (productive use). 30-42% of the breweries in urban areas, all managed by women, were equipped with an improved stove. A brewery that uses at least one improved stove may save 18% on fire wood, and up to 36–38% if all stoves are improved. However, in reality the savings in fuel wood occur mainly for the 20% largest breweries (IOB, 2013b). Whether an improved stove really leads to savings in each individual brewery depends on an array of behavioural factors. More generally, tradition seems to play a very important role in *dolo* breweries: the art of making the beer is transmitted from generation to generation and does not necessarily follow economic principles in the strictest sense. Brewers may continue to use the same quantity of fuelwood as with the traditional stove, since that is what they are familiar with, or to stoke the improved stove – despite the narrow opening – with the same large tree trunks that are used to stoke traditional stoves.

Users of biogas digesters do not belong to the poorest sections of the population because these households must own cattle and have capital to invest. Households in Rwanda that use biogas digesters reduced their daily consumption of fire wood by 4.7kg. This finding is in line with the literature (Arthur, Baidoo and Antwi; 2011) and is equivalent to a reduction of 30-32% of annual expenditure (i.e. EUR 48.60). In Indonesia, the biogas digesters led to 50% decrease in the use of LPG and hence the savings for fire wood were less (Bedi, Sparrow and Tasciotti; 2012). The rest product of biogas digester is slurry that can be used as fertilizer

for crop production. In Indonesia, part of the slurry was used to fertilise crops, part was dumped as waste and part was sold for use on tea crops. In Indonesia, one source of income that can be related to the use of a biogas digester is cooking larger quantities of food which are then sold on the street. In 65% of the villages where households have access to biogas there had been an increase in the sale of street food.

In terms of time savings households in Burkina Faso that have improved cooking stoves save 8-12% of the time used for cooking. This is in contrast with households that have a biogas digester. These households ultimately do not save time but need 23 minutes per day more to keep the digester in operation (fetching water, collecting dung, mixing water and dung and removing waste).

Based on the impact studies, improved systems for cooking or heating may help to reduce expenditure, although most households opt for using the cooking devices to improve comfort. In the countries studied, improved systems for cooking did not provide households with many opportunities to increase their income.

Electricity

The studies show that it is mostly households with a cash income and better education (civil servants, shopkeepers) who pioneer with new electronic devices. Rural electricity programmes usually assume that they contribute to production and investments, and therefore to economic development. In other words, having electricity would enable people to work after dark and thus increase productivity and hence income. However, the reality is more complex: electricity can be considered a precondition for more economic activity and development, but economic development depends on more factors than electricity alone, such as having a market with sufficient demand and consumer purchasing capacity. Sufficient power (tiers 4 and 5) is needed to drive the machinery or equipment for productive use that may lead to higher income. In the short term, small enterprises whose main activity depends on electricity, such as copy shops, benefit most from electricity. Access to credit is important for production. With electricity, a mobile phone can be charged and used, which enables money to be transferred or information to be obtained on product prices offered at surrounding markets (second-order effect). Money transfers, in turn, can function as an alternative to a micro credit system (IOB, 2013a).

The impact of electricity on income and expenditure of households is limited in the short run. In the middle run electricity triggers differentiation in productive use. Longitudinal studies claim that incomes of both households and rural towns with access to electricity show a swifter increase in income than those without access.

Well-being and comfort

From a poverty reduction perspective the impact of renewable energy on well-being is substantial: it improves safety, health, access to information and leads to changes in behaviour.

Both improved cooking stoves and biogas digesters are safer than having an open fire, although respondents do not state this as an impact. An open fire place disappears when a household has a biogas digester. In some cases the charcoal stoves remain, because the capacity of the digester is insufficient to enable multiple dishes to be prepared at the same time (Rwanda). Cooking stoves and digesters also have a positive impact on respiratory and eye diseases. The impact is largest on women and children, because these devices reduce the smoke in the kitchen. In general, the motivation to buy a digester mainly derives from the desire to have a clean kitchen, or, as was the case in Indonesia, to reduce the surplus of manure.

Electricity has a greater impact on well-being than on income and expenditure. For example, electric lighting enables households to modify their daily routine. Women mainly benefit from this, since they gain more freedom in planning their daily chores such as housekeeping and cooking, and have more time for more pleasurable activities, such as watching TV and playing with the children.

Electricity helps both men and women feel safer at night, especially those living in remote areas. The more centrally located areas are already familiar with light from dry-cell batteries (or car batteries or small solar devices) available at local markets. Children benefit from having electricity because the light enables them to do their homework after dark, which means they can play outdoors for longer. The evaluations did not produce evidence that being able to do homework at night means that more homework is actually done.

Education and health at a community level did improve, however, since health centres and schools with electricity attract better qualified staff. Parents are also more likely to send their children to a school that has electricity. Access to information and communication improves the level of education, production and trade. Electricity has enabled better access to information (television) and communication (charging mobile phones). There are indications that young people have adopted an urban lifestyle as a result of this. Television influences behaviour more strongly than radio. The impact evaluation showed that having electricity in Rwanda appeared to have influenced the perception of women that domestic violence is unacceptable.

In general, it can be stated that electricity has an impact that goes beyond cooking: there are more second-order impacts, such as those resulting from information obtained from television and mobile phones. The same applies to the impact of electricity on the community; it improves the quality of education, health and feelings of security. In addition, there are more often and quicker innovations in the electricity sector, such as in the area of solar devices, than in the cooking energy sector. Transition processes to sustainable energy use occur quicker in the area of electricity supply.

5.2 Environment and CO_2 emissions

IOB measured the impact of renewable energy on the environment and climate on the basis of secondary sources mainly. It is important to state that CO_2 itself is not the sole greenhouse gas and that black carbon and other particulate matter and substances (together known as short-lived climate pollutants) have a larger impact on global warming.

In general, the use of renewable energy sources by poorer communities in developing countries contributes only to a limited extent to the reduction of greenhouse gas emissions worldwide. Africa's share in the world's energy consumption is only 6% and its share of carbon dioxide emissions is 3.3% (World Energy Outlook, 2012). Only a quarter of the latter percentage is caused by households, mainly via vehicle emissions. From a climate perspective one could argue that programmes promoting the use of improved cooking devices cannot contribute enormously to climate mitigation. A biogas digester contributes more to the environment than improved cooking stoves, but worldwide the number of digesters installed is still limited and they work only if sufficient dung and water are available. In Indonesia, biogas digesters have an additional environmental benefit, namely that less manure enters the rivers. Yet one-third of the slurry produced is dumped in the environment. In general, the evaluated interventions have overestimated the contribution of the envisaged activities to the reduction of CO_2 emissions. The reason is that these programmes make use of test results instead of real user results, while it is implicitly assumed that fire wood that is not used for cooking will not enter the atmosphere. The counterfactual is not always correctly assessed. Since new energy sources and devices tend to be used in addition to existing sources for cooking or lighting, the renewable energy devices do not automatically replace devices using fossil fuels.

In conclusion, the impact of renewable energy on well-being is considerable. For cooking energy this applies in particular to health. The impact on a household's income and expenditure is limited in the short run, but in the case of electricity it is positive in the long run. The use of renewable energy sources by the poorer strata of society in developing countries hardly contributes to a mitigation of global greenhouse gas emissions. The evaluated interventions have overestimated the contribution of the envisaged activities to the reduction of CO_2 emissions.

6

Sustainability

Most of the projects evaluated assumed implicitly or explicitly that the market would guarantee the technical, financial and economic sustainability of the interventions. In most cases, however, the project proposals did not spell out what was understood by the 'market mechanism'. The energy sector is composed of international, national and local markets, and in these, private, public and semi-public entities play different roles. In many developing countries the generation, transmission and distribution companies face a financially precarious situation (IEG, 2008). Since the markets for renewable energy and energy products are relatively new in developing countries, the number of local entrepreneurs is still limited and they operate their enterprises with limited financial resources (IOB, 2013a, pp. 120-132). Opening up a market requires the public sector to be proactive in removing existing constraints and hurdles to enable private actors to become acquainted with the market opportunities; this is the real stage of market development. After this initial stage there needs to be a period in which an energy product can prove its worth and mature. This period requires investors with 'deep pockets' or at least the provision of medium- to long-term credit so that the stage of independent market operations can be reached. In rural areas, markets are thin because of a low population density and limited purchasing power of potential customers. As a result, these areas are less attractive to private entrepreneurs. Supply-side measures such as regulation, licensing, tax incentives and subsidies may stimulate customer interest (Kankam and Boon, 2009, p. 213).

Market development varies by type of intervention. In the case of improved cooking stoves it entails local manufacture by small enterprises, whitesmiths or masons, while in the case of solar energy, market development entails retailing and local assemblage. The challenge for solar lamps is to secure a position for better quality products among poor quality imported products. For micro hydro energy, market development implies establishing and sustaining the operation and maintenance of the systems and the financial provisions for replacement in the case of breakdown or malfunction. And market development is also different in the case of electricity supply via *grids* or *stand-alone* systems, which in rural areas are usually loss-making. In order to reduce the operational cost of supply and to bring services closer to the clients, some African countries have introduced *Energy Service Companies* that are better equipped to match local demand with available technology and capital. In Burkino Faso the Dutch electricity company NUON supported solar energy supplied by the local company Yeelen Ba, which can be considered to be an *Energy Service Company*.

With few exceptions (such as geothermal energy in Indonesia and EnDev), the PREP-financed activities were not involved in establishing the enabling conditions for market development. Only a few interventions funded with the PREP resources (*EnDev, biogas, Lighting Africa*) factored in a sufficiently long time horizon, or active support to establish commercial markets – or both.

Since improved cooking stoves have secured a place in the market (being supplied in a range of quality and for a range of prices), they can be considered financially and economically sustainable. Whether a market for biogas installation will develop in the absence of subsidies or sound credit supply is doubtful, due to the high price of acquisition in combination with the immobility of the device. Biogas light depends entirely on

imported equipment, including the short-lived lamp fuse. Home solar systems and solar lamps are usually imported or assembled products retailed on the market. From a policy point of view it is debatable whether these devices should be subsidised, in view of the swift penetration of solar devices in commercial markets. Arguments in favour of subsidies are the positioning of better quality products (*Lighting Africa*) or the use of solar devices in the context of pre-electrification programmes to familiarise future customers with electricity. Customers familiarised will have a higher electricity consumption once they have been connected to the grid, which makes supplying them with electricity commercially more attractive to the electricity company. The financial sustainability of the micro hydro installation in Indonesia is doubtful, due to poor organisation and lack of contingency funds for maintenance and replacement. From the perspective of financial sustainability, reaching increasingly less populated areas where customers use low volumes of electricity only (sometimes less than 1 kWh monthly).

Subsidies can be justified in cases where negative *externalities*, such as environmental degradation or the emission of the roll-out of grid electricity in Rwanda is fragile, due to the mounting operational deficit resulting from greenhouse gases can be mitigated. According to the UN *Sustainable Energy for All* strategy, direct subsidies are justified if focused on specific population groups such as for pico-PV equipment for the poorest strata in society. The disadvantage of subsidised products is the risk of distorting new and fragile markets.

The objective of renewable energy products is environmental sustainability. In that endeavour, the evaluated cooking energy projects and programmes turned out to be too optimistic in their envisaged achievements concerning CO_2 emission and savings in fire wood usage.

In conclusion, the programme designs of the evaluated interventions state that sustainability would be guaranteed by market development. It was assumed that actors in the market would continue to use and also upscale interventions. But the development of (new) markets takes time, often more than the duration of the programmes and projects. Only a small number of activities were directed towards enabling market development. Both in terms of policy development and implementation, the relation between market development and the provision of credit or subsidies has not received much attention.

7

Lessons learnt

1) Maintaining and further developing Dutch expertise and experience in the field of renewable energy in economically less developed countries are essential if the Netherlands intends to continue influencing the policy of (inter)national organisations/ institutions and for its international position worldwide.

2) A financial injection like PREP has the advantage that it swiftly yields results. However, the sustainability of these results and the Dutch reputation worldwide for renewable energy and development would have benefitted more if the Netherlands had phased out the provision of funding more gradually.

3) At an international level (including in the developing countries), renewable energy is increasingly seen as important for climate and for the availability of energy for domestic use. Thus there is a need for the Netherlands to have a clear vision on its renewable energy and development policy.

4) Whether the increasing demand for access to electricity in developing countries is met depends largely on the development of mobile communication and information facilities. From a climate perspective, policy should invest more in technological developments for clean electricity and communication that offer better prospects for sustainable energy use.

5) Given the policy shift from poverty reduction to climate issues, the Netherlands' policy on renewable energy could focus more on making power generation and distribution in towns and villages more sustainable, and focus less on cooking energy in rural areas.

Annexes

Annex 1 About IOB

Objectives

The Policy and Operations Evaluation Department (IOB) aims to contribute to knowledge of the implementation and impact of Dutch foreign policy. IOB meets the need for independent evaluation of policy and operations in all the policy fields of the Homogenous Budget for International Cooperation (HGIS). IOB also advises on the planning and implementation of evaluations falling under the responsibility of the policy departments of the Ministry of Foreign Affairs of the Netherlands and its embassies.

IOB's evaluations enable the Minister of Foreign Affairs and the Minister for Foreign Trade and Development Cooperation to give account to Parliament for their policies and for resources spent. In addition, the evaluations aim to contribute to learning by formulating lessons and options for policy improvements that can be incorporated into the ministry's policy cycle. Insight into the outcomes of implemented policies allows policymakers to devise new policy interventions that are both more effective and better targeted.

Organisation and quality assurance

IOB has a staff of experienced evaluators and its own budget. When carrying out evaluations, IOB calls on specialist knowledge from external experts with knowledge of the topic under investigation. By way of quality control, IOB appoints an external reference group for each evaluation, which includes not only external experts, but also relevant policy-makers from the ministry and other experts. Moreover, for each evaluation IOB appoints several of its own evaluators to act as peer reviewers. IOB's *Evaluation policy and guidelines for evaluation* are available on the website www.iob-evaluatie.nl, hard copies can be requested through the IOB secretariat.

Evaluation programming

IOB consults with the policy departments to draw up a ministry-wide evaluation programme. This rolling multi-annual programme is adjusted annually and included in the Explanatory Memorandum to the ministry's budget. IOB bears final responsibility for the programming of evaluations in development cooperation and advises on the programming of foreign policy evaluations. The themes selected for evaluation respond to requests from the ministry and Parliament and/or are considered relevant to society. IOB actively coordinates its evaluation programming with that of other donors and development organisations.

Approach and methodology

IOB aspires to relevance, high quality and methodological innovation. Whenever possible, the research applies both quantitative and qualitative methods leading to robust impact evaluations. IOB also undertakes systematic reviews based on empirical results relating to priority policy areas. IOB has extended its partnerships with evaluation departments in other countries, for instance through joint evaluations and evaluative knowledge exchanges, undertaken under the auspices of the OECD-Development Assistance Committee Network on Development Evaluation.

Annex 2 Overview of publications in the case of the IOB policy review on renewable energy and development

Programme	Publication
Improved cooking stoves, urban context, two main cities, Burkina Faso	Gunther Bensch, Michael Grimm, Katarina Peter, Jörg Peters and Luca Tasciotti (2013). Impact Evaluation of Improved Stove Use in Burkina Faso – FAFASO. RWI (Essen) and ISS (Erasmus University Rotterdam). http://www.iob-evaluatie.nl/sites/iob-evaluatie.nl/files/BF-ICS%20Report_20130304.pdf
Improved stoves for local breweries, nationwide, Burkina Faso	Michael Grimm, Jörg Peters (2013) Impact Evaluation of Improved Stove Use among Dolo-beer Breweries in Burkina Faso – FAFASO. RWI (Essen) and ISS (Erasmus University Rotterdam). http://www.iob-evaluatie.nl/node/696
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For decades, Dutch development cooperation has paid attention to renewable sources of energy in the context of development cooperation. In 2008 the minister for Development Cooperation announced a financial input of EUR 500 million for renewable energy programmes in developing countries through the 'Promoting Renewable Energy Programme' (PREP), which has been effective in providing more than 14 million people with access to renewable energy. Moreover, the ministry has also been effective in influencing the policy of development partners involved in energy investments. The impact of renewable energy on well-being is considerable. The impact on income and expenditure is limited in the short run, but in the case of electricity it is positive in the long run. From a climate perspective, the evaluated interventions hardly contributed to a mitigation of global greenhouse gas emissions.

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