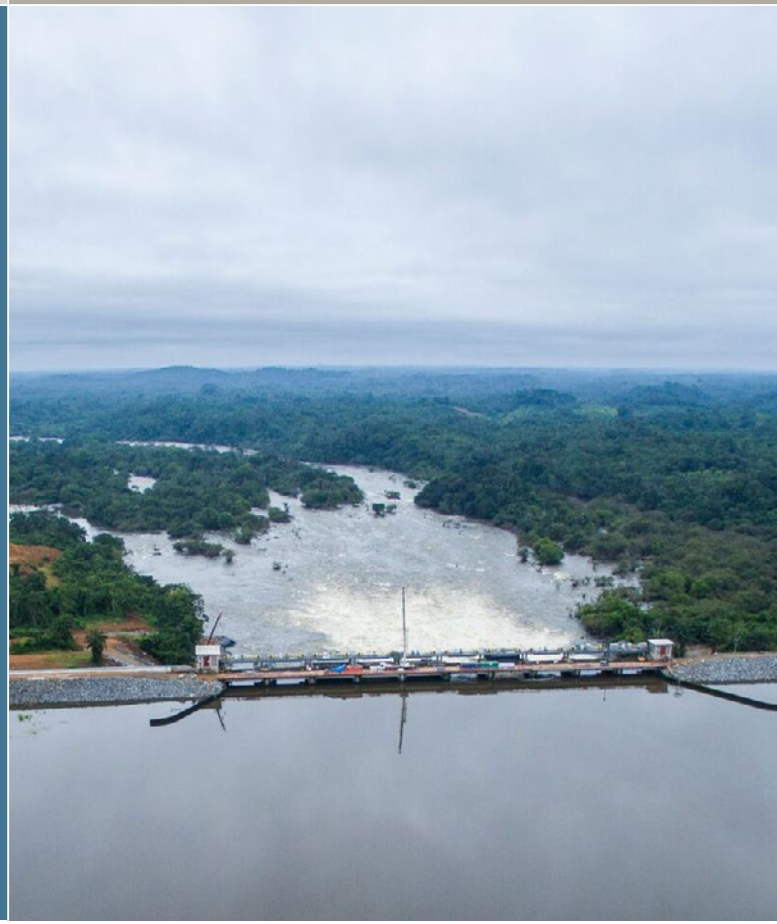
Norad

The Clean Energy Initiative

Results Report 2007–2015



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Foreword

Access to sustainable, affordable, and reliable energy services is crucial for eradicating poverty, spurring economic growth, and ensuring environmental sustainability. I am proud to present *The Clean Energy Initiative, Results Report 2007-2015,* accounting for the breadth of Norwegian support to the energy sector.

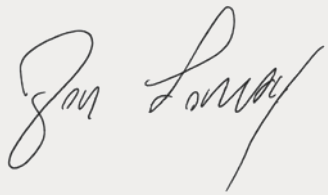
The Initiative has contributed towards improved access to modern energy services for at least eighteen million people and 6 000 MW new electricity generation capacity. In addition, support to improve institutional capacity of governments and electricity utilities has contributed to increased investments and better natural resource management in a number of partner countries. Some interventions can document that they have also had a positive impact on livelihoods, employment, and social services. It also illustrates that support to the energy sector needs to take a long-term perspective, from planning to infrastructure building, and from developing enabling regulatory frameworks to building the capacity to manage and operate effective energy systems. There is no quick fix. Fragile states are fraught with high risk and setbacks, and are all the more reliant on grant support, whereas other countries begin to attract commercial investors and accelerate new generation capacity investment.

At least two-thirds of greenhouse-gas emissions come from the energy sector. The world's poorest people are vulnerable to both energy poverty and climate change. Load shedding and unreliable power supply results in industrial production loss, slower economic growth and employment, as well as negatively affecting schools, hospitals and households. This in turn leads to widespread use of diesel generators, which is costly and polluting. Nearly three billion people use open fires or inefficient stoves for daily cooking and heating. Indeed, the World Health Organization (WHO) estimates that exposure to smoke from the simple act of cooking constitutes the fourth leading risk factor for disease in developing countries, and causes 4.3 million premature deaths per year.

To ensure no-one is left behind, a transition to clean and affordable energy is vital.

As confirmed by the United Nations Sustainable Development Goal for Energy (SDG7) and the Paris Agreement on Climate Change entered into force in 2016, the global community must continue to support sustainable energy development.

Norway, along with its many development partners, will continue to strive to make a difference, by supporting countries, programmes and organizations that inch us towards the global goal of universal access to sustainable energy.



Jon Lomøy
Director General
Norad

PREVIOUS VIEW

1 Quantifiable results and key findings

»Since it was established in 2007, the Clean Energy Initiative has contributed to providing access to clean energy to an estimated 18 million people.

Moreover, the Initative has supported energy infrastructure construction and associated capacity building, research and education in partner countries.

This chapter summarizes the main quantifiable results and key findings of the Initiative, and attempts to illustrate impacts achieved using selected examples.

A group of young girls doing their homework. Light for evening studies is a key benefit of access to electricity. PHOTO: KEN OPPRANN

Quantifiable results of the clean energy initiative 2007–2015

Access to **modern energy services** for **18 million people**

- Electricity: about **10.5 million**
- Improved cookstoves & biogas: about **7.5 million**

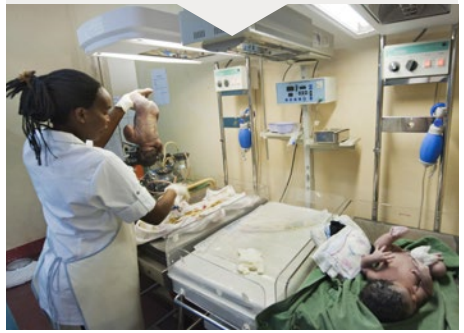


PHOTO: KEN OPPRANN

Construction of **6 000 MW** of generation capacity

- Estimated to cover the annual consumption of 30 million people
- Hydro, solar and wind power
- CO2 emission reductions from Norfund's investments, 24 million tonnes

PHOTO: NORFUND

Construction of **9 000 kilometres** of transmission & distribution lines

PHOTO: KEN OPPRANN

Improved **energy sector governance** in 11 countries. Strenghtened **renewable energy research** institutions and human knowledge base in 8 countries, including:

- 250 master & PhD students in clean energy technology
- 3,100 short-term courses & seminars in clean energy

PHOTO:KEN OPPRANN

An overview

THE CLEAN ENERGY INITIATIVE

In 2007, in recognition of the critical role energy plays in development, Norway decided to build on its energy development experience and increase its support to clean energy.

Subsequently, the Norwegian Clean Energy for Development Initiative (the Initiative) was established with the aim of increasing:

- Access to clean, reliable and affordable energy in poor countries
- Energy production
- Human capacity and improved institutions

The overall purpose of the Initiative is to enable poverty reduction and economic growth, and contribute towards establishing cleaner development paths.

The Initiative's approach has been broad and pragmatic, ranging from support to institutional strengthening, education and research, electrification projects, provision of clean cookstoves and solar home systems, to hydro– and solar power and transmission line construction.

Various channels of support are used, from multilateral organizations, direct government support, international organizations, to non-governmental organizations.

RESULTS

The purpose of the report has been to collect, document and synthesize the main results achieved from the Initiative in 2007 to 2015. The report is not a review or an evaluation. To the extent possible, results are quantified, however, while many results are partly or fully quantifiable, a range of outcomes and impacts cannot be quantified in a meaningful way.

Several impact assessments and reviews from the period covered in this report indicate that results of the Initiative have had lasting impacts on the livelihoods and economic opportunity in partner countries. Employment has been created. Schools, hospitals, businesses, as well as households have been electrified. With a light bulb, school children can do their homework at night. A clean cookstove reduces indoor air pollution and improves health.

Expansion of the electricity grid into rural areas creates employment at a small sawmill or bottling plant, to name a few.

The report also finds that operating and making an impact at earlier stages of development and in fragile states is inherently challenging.

This chapter presents both the main quantifiable results as well as key findings that we would like to highlight. The Initiative's broad portfolio reflects the fact that different parts of the energy system require different and often highly targeted types of support – yet all parts must function to achieve lasting results.

Mt. Coffee Hydro Power Plant in Liberia, Powerhouse. PHOTO: DAWNUS INTERNATIONAL

KEY FINDING

1

A broad approach

Developing a viable power sector in combination with other energy solutions, for example, clean cooking solutions, requires a long-term strategy and a broad approach to energy development, and supporting various energy sub-components according to a country's specified need.

PHOTO: ØRNULF STRØM

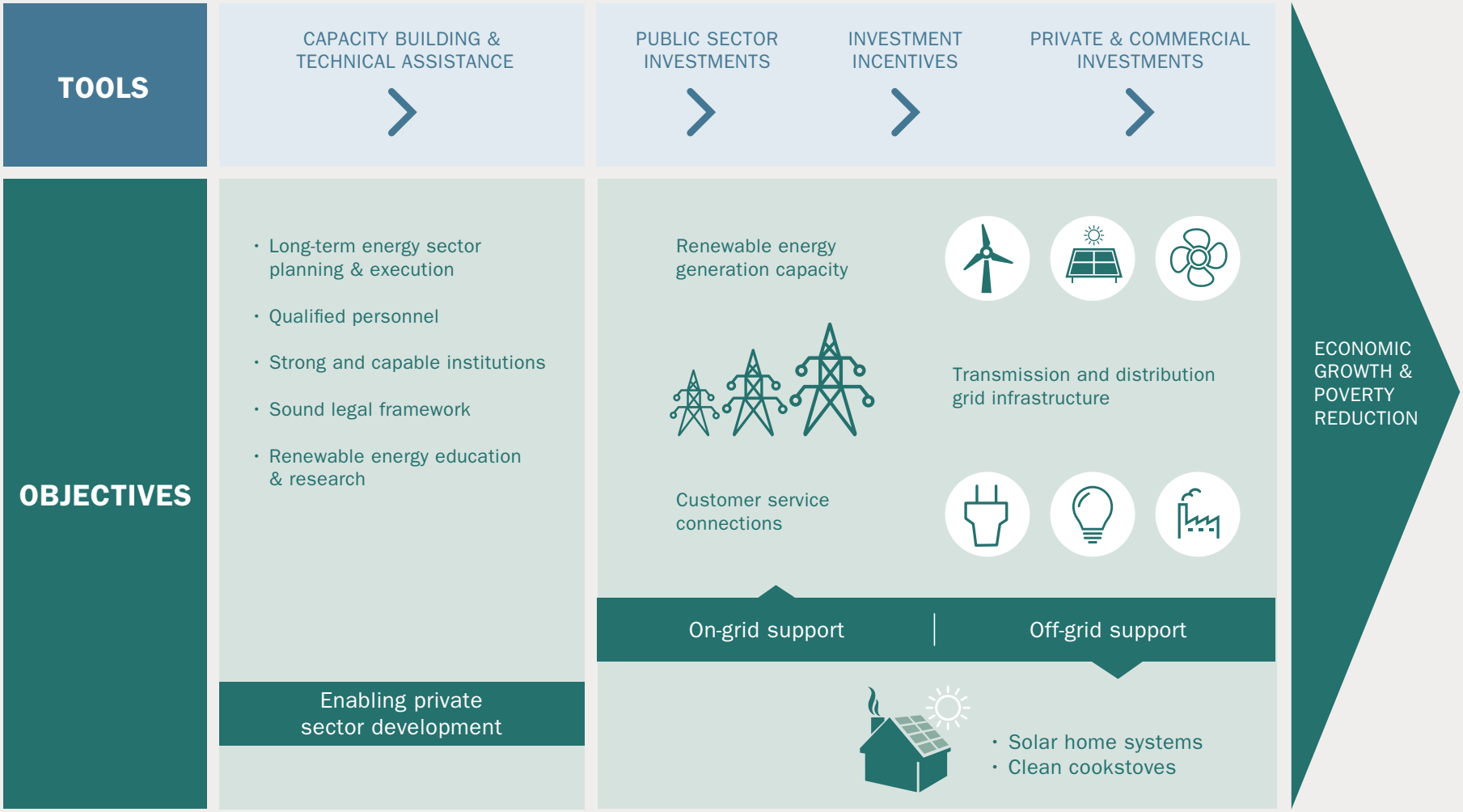
PHOTO: KEN OPPRANN

The Initiative's broad portfolio reflects the fact that different parts of the energy system require different and often highly targeted types of support – yet all parts must function to achieve lasting results.

This country-tailored approach has resulted in support ranging from assistance to develop hydropower feasibility studies in Bhutan, support to clean cookstoves and micro-hydro systems in Nepal, equity investments in Africa's largest wind farm in Kenya, and rural electrification in Mozambique, to name a few. It also includes support through different channels, from multilateral banks, international organizations, civil society organizations as well as direct support to governments.

Integrated into the approach, is consideration of cross-cutting issues like gender, environment and climate, anti-corruption and human rights. For example by undertaking Environmental and Social Impact Assessments.

FIGURE 1 // A BROAD APPROACH



KEY FINDING 2

Building capacity is key

Infrastructure investments alone are insufficient to establish sustainable power sectors. To ensure sustainable operations and long-term development, human capacity and organisational strength are equally important. This can include support to education and research.

QUALIFIED HYDROLOGISTS THROUGH INSTITUTIONAL COOPERATION

For five years, institutional cooperation between the power sector regulators of Norway and Liberia has built a hydrological network that collects data from rivers in Liberia. The network is now fully operated by Liberian authorities, providing data that is vital for future hydropower development in the country.

READ MORE >

Liberia Hydrologial Services (LHS) in the field.

PHOTO: GREGOR PERZYNA

Through institutional twinning projects Norway has contributed to improved sector governance and more efficient power utility operations in eleven partner countries. Institutional cooperation through NVE (Norwegian Water resources and Energy Directorate) has focused on creating an enabling environment for investments and sector governance through, for example, development of legislation. Within the field of renewable energy, Norwegian programmes for research and higher education has also supported 219 Master and 25 PhD students and strengthened institutions in eight partner countries between 2007 and 2015.

HYDROLAB NEPAL – ENGINEERING CAPACITY

Hydro Lab Nepal is a hydropower laboratory developed in 1989 with the cooperation and experience from the Norwegian University of Science and Technology (NTNU). The lab specializes in modeling planned hydropower projects, testing various designs for achieving the best possible solutions. The lab has about 30 permanent employees, ranging from doctoral engineers to skilled workers.

An international master's program in Hydropower Development was founded at NTNU. Approximately 10 Nepalese students graduate from this programme every year. Several of the engineers at Hydro Lab have parts or all of their university education from NTNU.

Nepealese and Norwegian student collaborating in the terrain model at HydroLab Nepal PHOTO: HANNE NØVIK

FEMALE ENGINEERS BREAKING GROUND IN TANZANIA

The engineering business in Tanzania is highly male dominated. Many women taking an engineering education are never registered as engineers because practice is required to be registered. Norway therefore supported graduated female engineers to conduct a three-year internship with public or private companies, resulting in an official engineering registration. The number of registered female engineers in Tanzania has more than doubled since the start of the project in 2010.

PLAY VIDEO

Angela Genes received support for an internship and has now worked with the international engineering company SMEC in Dar es Salaam, Tanzania, for five years. Link to report PHOTO: KEN OPPRANN

KEY FINDING

3

Investing in electricity generation

Commercial investment in energy production is critical to meet electricity demand. It requires industrial competence, understanding of the market and the ability to handle risk. The extent to which countries facilitate private investments in the energy sector varies.

An investment of nearly USD 500 billion in new electricity generating capacity is needed to meet the required growth in Sub-Saharan Africa until 2040. It is widely recognized that Official Development Assistance can only support a very limited part of this need. Attracting commercial investments in electricity generation is therefore critical and one of the key objectives of the Clean Energy Initiative.

Development Finance Institutions (DFIs) and public-private investment funds play a key role. Successful commercial investments in power generation can expand and strengthen the power sector, and potentially lower the perceived investment risk to pave the way for other private investors.

Forty-four percent of total financing under the Initiative between 2007 and 2015 has been channeled through commercial investments. The Norwegian government-owned DFI Norfund is the most important tool in this regard for Norway, investing NOK 6.5 billion in energy in the period.

While hydropower has dominated the energy portfolio until recently, solar and wind energy have become more competitive and account for an increasing portion of the portfolio.

A number of factors make private sector investments in the power sector challenging and in some countries and markets prohibitive due the policy, regulatory, financial and commercial risks. This will particularly be the case in fragile states. However, Norfund is gradually moving more capital from middle income countries in South America and South Asia, to low income countries in sub-Saharan Africa.

Bhutan Tala Hydropowerplant dam. PHOTO: KEN OPPRANN

NORFUND – NORWAY'S PRIMARY TOOL FOR INVESTING IN ENERGY PRODUCTION IN DEVELOPING COUNTRIES

The Norwegian Investment Fund for Developing Countries (Norfund) is a state-owned investment fund mandated to develop sustainable enterprises in developing countries. Norfund invests in clean energy, financial institutions and agribusinesses and is Norway's most important instrument for private sector development in low- and middle-income countries.

READ MORE >

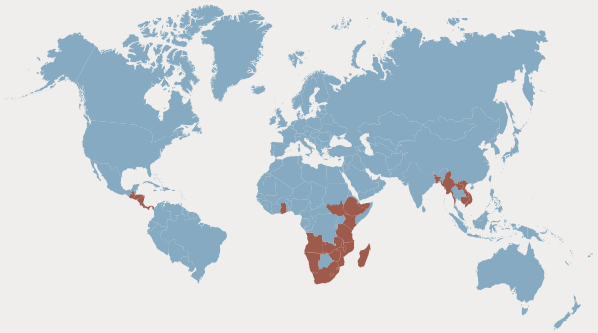
Norfund

KEY RESULTS 2007–2015

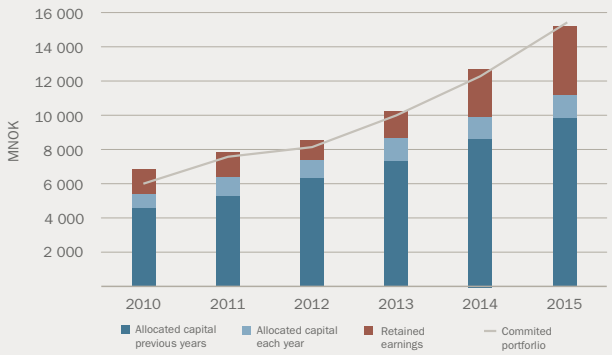
Generation

Hydro power: 2726 MW
Wind power: 933 MW
Solar power: 492 MW
Natural gas: 1 172 MW
Other: 165 MW

PRIORITY COUNTRIES



PORTFOLIO



East Africa's first on-grid solar PV plant

Scatec Solar and Norfund's 8.5 MW utility scale solar PV plant in Rwanda was commissioned in 2014, as the first of its kind in the region. When built, the plant represented approximately 10 percent of the total power generation capacity within the national grid.

READ MORE >

Norwegian Prime Minister Erna Solberg at the opening of the solar power plant. PHOTO: SCATEC SOLAR

KEY FINDING

4

Enabling modern societies

Access to modern, affordable and reliable energy services enables improved public services, including health-care, educational services, social management and administration.

RESEARCH ON HOW ELECTRIFICATION AFFECTS LIVES

"Power provides new technological opportunities. Having light at night is obviously progress for both children doing their homework and adults who run local businesses. Electric pumps get clean water to the consumers and people who previously had to walk far to get water now save considerable time. On Zanzibar, this meant that young girls no longer needed to help their mothers fetch water. Instead, they went to school just like the boys. Watching TV also provides ideas about how life can be lived. In areas where people have access to electricity and television, women have fewer children. It is not completely understood why, but in my study at Zanzibar, it had a lot to do with how time was spent: People felt they had less time, they watched TV in the evenings, went to bed later, and had less time alone as a couple.

The home of Joy Nyalu and her family in Kabukero. PHOTO: WWF-NORWAY/WILL BOASE

From an interview with Associate Professor Tanja Winther, Centre for Development and the Environment at the University of Oslo, about her research on how electrification affects the lives of the poor.

ST. FRANCIS HOSPITAL IN UGANDA – SAVING LIVES WITH POWER

The St Francis hospital in Mutolere in Western Uganda is one of the many locations that have obtained electricity through rural electrification projects financed by Norway. The hospital has 250 beds and treats at least 50 patients a day. The hospital also accommodates 250 students in nursing and medicine. Even though power cuts do still occur, improved access to electricity has had an immeasurably positive impact on the hospital: light all day round, modern electrical treatment equipment, the ability to boil water for disinfection, refrigeration for medicine and food and use of computer systems.

Midwives at the St. Francis Hospital handle 10 –20 births every day and save many infants through use of incubators – a device dependent on stable power supply. PHOTO: KEN OPPRANN

"Most of Africa's school children attend classes without access to electricity. In Burkina Faso, Cameroon, Malawi and Niger, over 80 per cent of primary schools lack access to electricity."

– POWER PEOPLE PLANET, AFRICA PROGRESS REPORT 2015

ENERGIZING DEVELOPMENT (ENDEV) – ACCESS TO MODERN ENERGY SERVICES

The International Energizing Development programme has facilitated 34 000 small and medium enterprises starting up, using modern energy services for productive uses. In addition, the programme has supported 17 800 social institutions gaining access to modern energy services, including 8 400 schools and 700 health centres globally.

FOTO: KEN OPPRANN

KEY FINDING

5

Creating jobs

Access to modern energy services enables entrepreneurship and creates jobs. A number of in-depth studies have quantified these effects.

In a survey conducted by the World Bank, 40 percent of African businesses report that the lack of access to reliable electricity supply is a major or severe constraint for their operations. This number is particularly high in the least developed countries.

The Initiative has addressed this issue directly through support to infrastructure investments and capacity building, with a strong focus on providing reliable and affordable electricity for productive use. It is difficult to measure how many jobs are created per megawatt of renewable energy generating capacity or per kilometer of transmission line in every project. However, as highlighted in this report, a range of programmes have successfully documented these effects. For example, it has been estimated that more than 1 000 permanent jobs and 2 000 temporary jobs where created through the Global Energy Efficiency and Renewable Energy Fund in 2015. The National Rural and Renewable Energy Program in Nepal states in its progress report dated October 2015 that more than 3 600 jobs have been created. Energizing Development states in its 2015 Annual Report that it is has facilitated more than 10 000 new jobs (mostly part time) with a share of female employees of 40 per cent.

Electrification, Nepal. PHOTO: KEN OPPRANN

A MODERNIZED SAWMILL AND 25 JOBS

Mrs. Balbina Fimiosse Massingue (43) (far right) employs over 25 full time workers at her timber concession and sawmill. The business was connected to the national grid as a result of the Namacurra electrification project in Mozambique. When the grid reached Mocubela in 2008 Balbina was still selling nuts at the market. By 2013 she had saved up enough to invest in the sawmill. Without electricity from the grid, it would not exist, due to the high cost of electricity from diesel generators.

PHOTO: INGAR FLATLANDSMO

GENERATING HYDROPOWER AND 10 000 JOBS

Ugandas first commercially financed hydropower project

The 13 MW hydropower project Bugoye in western Uganda was developed by the Norwegian power utility, TrønderEnergi and Norfund. It was commissioned in 2009.

A study by the Overseas Development Institute (ODI) in 2013 found that construction of Bugoye helped create 10 000 new jobs in Uganda. Of this, 1 000 jobs were generated directly in the planning, construction and management of the plant, while the majority of the new jobs were indirectly created due to increased electricity access in the local communities and the region.

Bugoye power house PHOTO: KEN OPPRANN

Construction of Bugoye created many local jobs. Here construction workers fill the walls of the canal with concrete. PHOTO: KEN OPPRANN

KEY FINDING

6

Accepting a degree of risk

In some countries, the risk of investing commercially is too high to attract investors or the transmission infrastructure is insufficient. Often grant funding will be the only available source of funding that can provide support to develop a nascent sector and enable investments in the longer-term.

The Initiative supports programs and projects in some more challenging environments where attracting commercial investors is difficult. In Liberia, for example, the Initiative provided direct support to rebuilding the Mt. Coffee hydropower plant, which had to be entirely financed by the Government of Liberia and development institutions.

Equally, a power plant investor must be able to transport electricity to the customer. Therefore, sufficient electricity transmission and distribution infrastructure to transport power to the customers is necessary and is usually carried out by the national Government. Norway therefore, has provided support to governments to construct transmission lines to transport power from independent power plants to major towns in, for example, Nepal and Uganda.

Accepting a certain degree of risk where the energy sector is more nascent is necessary and some anticipated results do not materialize, or take longer than planned to materialize.

UNANTICIPATED PUBLIC HEALTH RISK

Liberia suffered a 14-year long civil war destroying infrastructure and devastating the country's human capital and public institutions. Political stability has prevailed but the fragile country was struck by the overwhelming Ebola pandemic in 2015. As a result, reconstruction of the Mt. Coffee hydropower plant is estimated to have been delayed by about a year.

Mt. Coffee HPP spillway dam, refurbishment of flood gates.
PHOTO: KNUT GAKKESTAD

RISK OF POLITICAL INSTABILITY

Since independence in 2011, South Sudan has continued to struggle with internal conflicts that hamper state building and economic development. The energy system essentially needs building from scratch. Norway has provided support for the development of the 42 MW hydropower plant Fula Rapids. The intention is to use development support to reduce the risk for potential commercial investors such as Norfund to invest. However the project had to be put on hold in May 2014 due to the ongoing civil unrest, just as construction was ready to commence.

Proposed site area for Fula Rapids hydropwer plant. PHOTO: NORFUND

DELAYS DUE TO POLITICAL, SECURITY, NATURAL DISASTER AND PUBLIC HEALTH CHALLENGES

More than half of the pilot countries under the multilateral Scaling Up Renewable Energy Program (SREP) are fragile states. Development and submission of SREP projects for funding approval has met serious delays due to political, security, natural disaster and public health challenges. For example, the Ebola virus in Liberia and Sierra Leone, war and conflict in Mali and Yemen, and natural disasters in Nepal and Vanuatu. Furthermore, changing market conditions, contractual issues, regulatory environments, institutional capacity of the executing agencies have contributed to delays in various countries and projects.

KEY FINDING

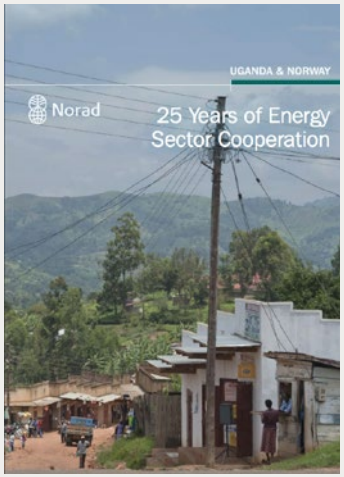
7

A long-term perspective

Increasing access to electricity requires a long-term government plan and strategy along with support from partners.

UGANDA

The Norad report Uganda & Norway 25 Years of Energy Sector Cooperation provides an interesting case of the lasting impact that can be achieved by applying pragmatic, comprehensive and long-term support to energy sector development. Notably, Uganda was recently ranked the 3rd best country in Africa for investment in renewable energy by Bloomberg New Energy Finance. However, such sustainable results were only observable after 25 years, and the support has contributed to Uganda's success story, with an energy sector that is today helping drive the economy and attract private investment.



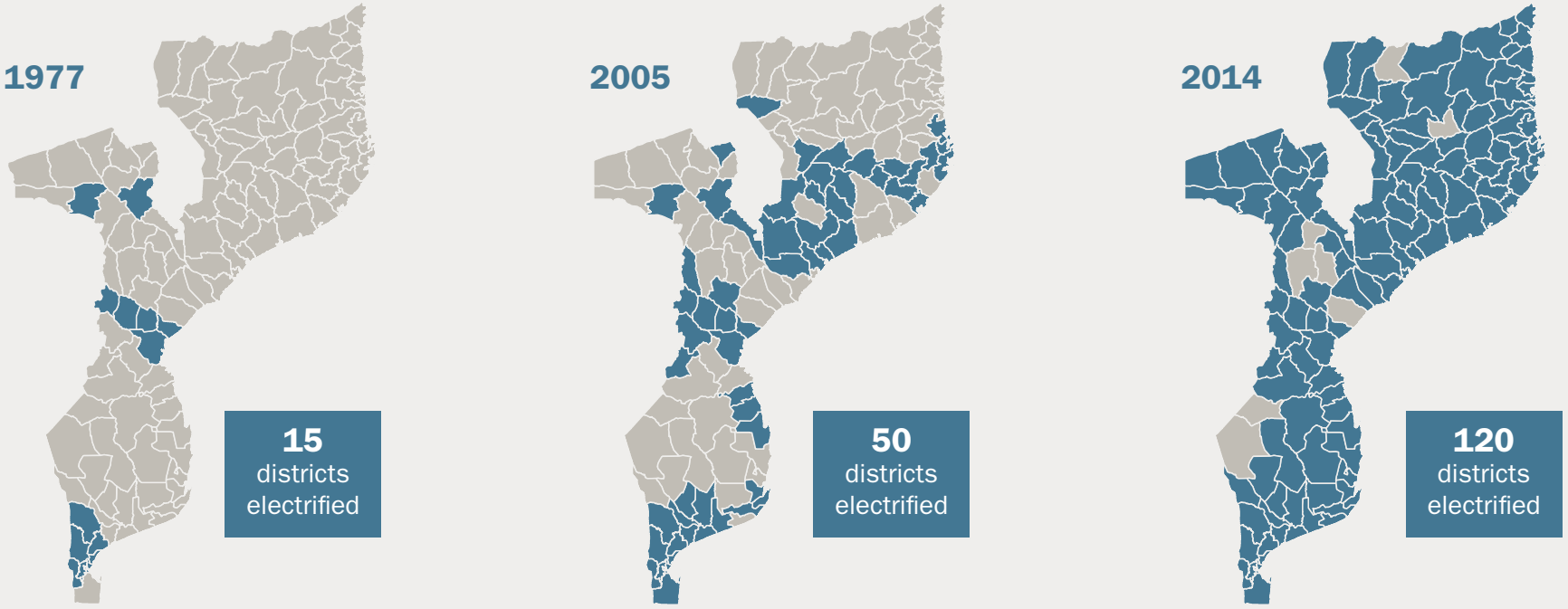
The energy sector requires stable and consistent policies and sound framework conditions in a long-term perspective. Good governance and long-term planning and support are critical to achieve sustainable, long-term results.

This report only looks at the period between 2007 and 2015 which in the context of energy development is a relatively short period of time. Furthermore, it is important to note that transformational development only takes place when there is strong national government ownership, leadership and planning which in turn can be supported by partner countries.

MOZAMBIQUE

Electrification of the country was an important priority of the Government of Mozambique after the end of the civil war in 1992. Several donors, and particularly Norway and Sweden, supported this effort. Norway and Sweden financed substantial parts of the transmission and distribution network from the middle to the north of Mozambique. Norway also provided capacity building of the national utility EDM. While a handful of Mozambique's districts were connected to the grid in 2005 (see illustration), most districts are connected today. Between 2007 and 2015 the grid electricity access rate increased from 11% to 26%. Another factor explaining the electrification of the country is access to cheap electricity from the Cahora Bassa hydro dam in the Tete region.

About 20 years after the civil war ended, the first commercial investments in the power sector have also taken place. In October 2016, Scatec Solar, Norfund and EDM signed four agreements regarding the development of a 40 MW solar power plant. This is the first commercial, grid-connected, renewable energy project in Mozambique.



PREVIOUS VIEW

Way forward

According to the International Energy Agency (IEA) 2015 World Energy Outlook, hundreds of millions of people have gained access to modern energy services over the last two decades. Rapid economic development in several developing countries, increasing urbanization and ongoing energy access programs have all contributed towards this achievement.

Nevertheless, Sustainable Energy for All (SE4ALL) estimated that 1.1 billion people do not have access to electricity, and more than 2.9 billion people still rely on the traditional use of solid biomass for cooking. More than 95% of those without access to electricity live in sub-Saharan Africa and developing Asia, predominantly in rural areas.

Building on our broad experience and expertise in energy for development, Norway will continue, together with the international development community at large, to support the overall goal of universal access to modern energy services by 2030 (see Sustainable Development Goal 7 box).

Gigawatt project Rwanda. PHOTO: SCATEC

"The social, economic and human costs of Africa's energy crisis are insufficiently recognized.

Energy-sector bottlenecks and power shortages cost the region 2-4 per cent of GDP annually, undermining job creation and investment. Companies in Tanzania and Ghana are losing 15 per cent of the value of sales as a result of power outages."

– POWER PEOPLE PLANET, AFRICA PROGRESS REPORT 2015

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UNITED NATIONS SUSTAINABLE DEVELOPMENT GOAL #7

Ensure access to affordable, reliable, sustainable and modern energy for all

- By 2030, ensure universal access to affordable, reliable and modern energy services
- By 2030, increase substantially the share of renewable energy in the global energy mix
- By 2030, double the global rate of improvement in energy efficiency
- By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology
- By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support

Read more at:
un.org/sustainabledevelopment

PHOTO: KEN OPPRANN

2 The Clean Energy Initiative – Introduction

»**Access to** sustainable, affordable, and reliable energy services is crucial for eradicating extreme poverty, spurring economic growth, and ensuring environmental sustainability. In support of this, the Clean Energy Initiative's policy platform was launched and operationalized in 2007.

Efforts to support major national infrastructure projects as well as decentralized solutions to promote economic and social development are central to the initiative. Further, the Initiative has provided broad support towards institutional capacity building and technical assistance, energy education and research.

Mount Coffee hydropower project, Liberia. PHOTO: DAWNUS INTERNATIONAL

Interventions to increase clean energy access

THE CLEAN ENERGY INITIATIVE

In 2007, in recognition of the critical role energy plays in development, Norway decided to build on its energy development experience and increase its support to clean energy.

Subsequently, the Norwegian Clean Energy for Development Initiative (the Initiative) was established with the aim of increasing:

- Access to clean, reliable and affordable energy in poor countries
- Energy production
- Human capacity and improved institutions

The overall purpose of the Initiative is to enable poverty reduction and economic growth, and contribute towards establishing cleaner development paths.

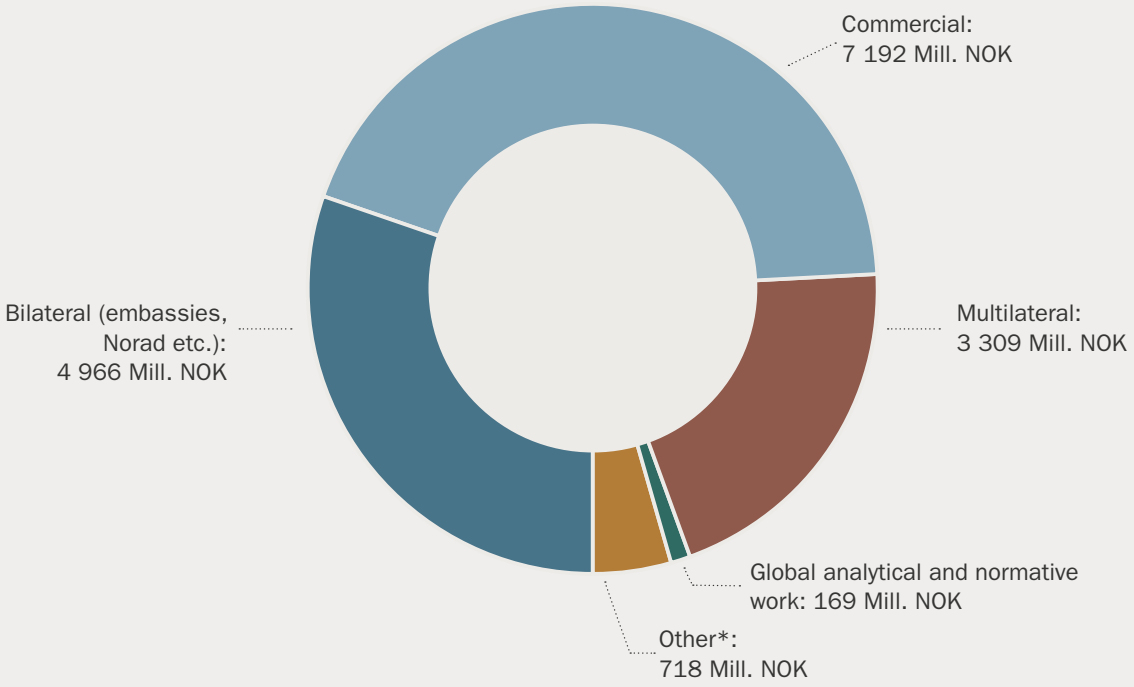
Children doing homework and watching TV on the island of Pemba, Tanzania. A sea cable from the mainland has connected the island to the electricity grid. PHOTO: KEN OPPRANN

Although countries face many of the same challenges in improving access to energy services, the history, geographical and population characteristics and context of each country are unique. Consequently, the Norwegian approach is tailored to the specific context and needs of each country. This has resulted in a broad portfolio of support ranging from assistance to develop an Electricity Law in Liberia, equity investments in wind power in Kenya, to support for rural electrification in Mozambique. This holistic approach builds on an understanding of how different parts of the energy system are supported to achieve results, as well as partner countries' own plans and strategies.

Channels of support

Total undertaken energy disbursements in the period 2007 – 2015 amount to NOK 16.4 billion. This number also includes core support to multilateral organizations, amounting to NOK 1.9 billion.[1] Figure 2 provides an overview of the distribution of this amount through different channels.

FIGURE 2 // SUPPORT BY CHANNEL (MILLION NOK) 2007 – 2015



* The label "other" covers support not addressed in this report. This includes among others the Oil for Development initiative and for non-proliferation of nuclear energy, energy assistance to East Europe, Central Asia (except Afghanistan), the Middle East and North Africa unless there is an investment undertaken by Norfund.

1 The remaining NOK 14.5 billion of the total has been reported to the Organisation for Economic Co-operation and Development's (OECD) Development Assistance Committee (DAC) as energy assistance under OECD/DAC codes 231 to 236.

PREVIOUS VIEW

MAIN CHANNELS OF SUPPORT

The Clean Energy Initiative

Multilateral support

Norway supports the energy sector efforts of multilateral financing institutions such as the World Bank and the UN system.

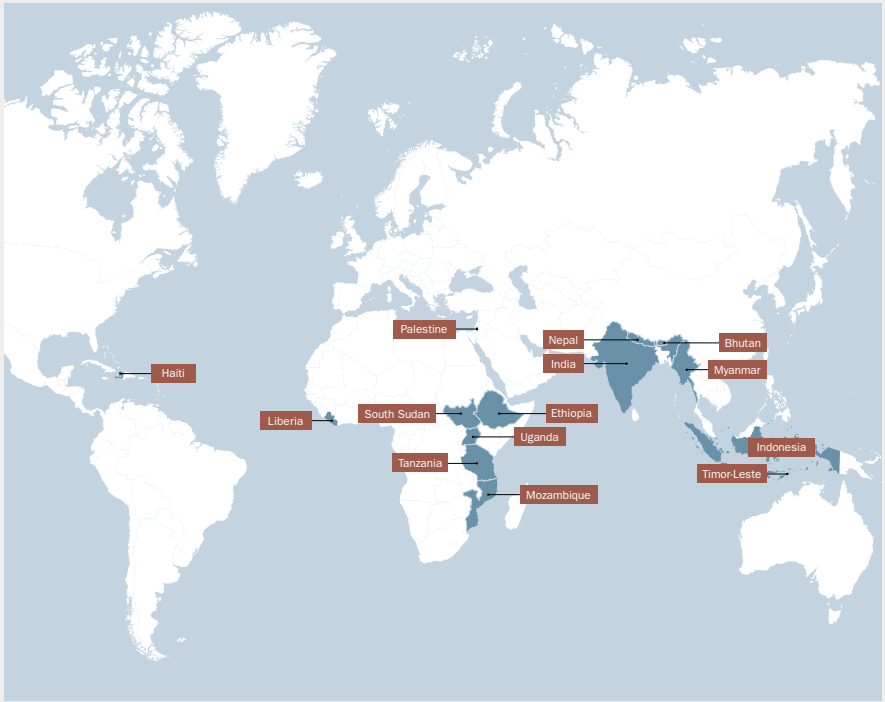
Commercial investments

Norway contributes equity to projects directly through Norfund, and other public-private investment funds. It also supports programmes providing guarantees and subsidies.

Bilateral support

Norway contributes grant support directly to partner countries through public channels as technical assistance and capacity building, or support to infrastructure projects (see map on the right). This includes support to civil society.

PARTNER COUNTRIES FOR BILATERAL SUPPORT



Structure and content of this report

This report presents the results acheived under the Clean Energy Initiative in the period between 2007 and 2015. The report has to a large extent been structured so that each chapter presents i) a main channel for support or ii) a type of support.

To the extent possible, results are quantified under each channel or type of support. However, while many results are partly or fully quantifiable, a range of outcomes and impacts cannot be quantified in a meaningful way.

The chapter on Methodology outlines the applied approach and methodology for quantifying results in this report. The chapter also describes some of the complexity and limitations in estimating results.

3 Global partnerships

» **Norway supports** various organizations that carry out normative and analytical work to improve knowledge, coordination and framework conditions for clean energy investments and greenhouse gas mitigation.

PHOTO: NORFUND

PREVIOUS VIEW

Norway engages in several international dialogues and partnerships in support of sustainable energy development. These aim to convene actors in the energy sector to improve efficiency, avoid duplication, pool resources and gain synergies from different areas of expertise. For example, as part of its efforts to foster a more coordinated approach to energy development, Norway launched the International Energy and Climate Initiative Energy+ in 2011. Around the same time, the United Nations Secretary-General launched the Sustainable Energy for All (SE4All) initiative. More recently, the USA-led Power Africa, with whom Norway signed a Memorandum of Understanding in 2016, has also emerged as a framework for coordinating efforts to support energy development in sub-Saharan Africa. This chapter presents some key organizations and initiatives supported by Norway.

TABLE 1 // MAJOR GLOBAL, NORMATIVE AND ANALYTICAL ENERGY PROGRAMMES SUPPORTED BY NORWAY IN THE PERIOD 2007-2015

PROGRAMME/DESCRIPTION	PERIOD	EXPENDITURE (MILLION NOK)
Sustainable Energy for All (SE4All)	2012 – 2015	42
United Nations Environment Programme. 1 Gigaton Coalition	2014 – 2015	9
Renewable Energy and Energy Efficiency Partnership (REEEP)	2006 – 2012	56
International Energy Agency (IEA)	2011 – 2013	16
International Renewable Energy Agency (IRENA)	2010 – 2016	24

KEY INITIATIVES AND PARTNERS

Sustainable Energy for All (SE4All)

The SE4All initiative is a multi-stakeholder partnership between governments, the private sector, and civil society. It has three interlinked objectives for 2030:

- Ensure universal access to modern energy services
- Double the global rate of improvement in energy efficiency
- Double the share of renewable energy in the global energy mix

Norway was one of the first supporters of SE4All. Norway has contributed financially as well as in an advisory capacity to the Advisory Board and the Executive Committee. Through this initiative, the topic of energy has become a recognised issue on the development agenda. Advocacy through the SE4All initiative and its partners culminated in the adoption of a Sustainable Energy Goal for energy (SDG7) in 2015. Norway supported this process by, for example, taking the lead together with Tanzania, Mexico and India to support the Post 2015 Consultations for Energy and supporting the UN Decade on Sustainable Energy for All, 2014 – 2024.

The International Energy Agency (IEA)
The International Energy Agency (IEA) was established in November 1974 to promote energy security and provide research and analysis on ways to ensure reliable, affordable and clean energy for its 29 member countries and beyond. IEA and Norway co-hosted the "Energy for All: Financing access for the poor" Conference in Oslo, October 2011 and Norway has supported IEA's analytical work on energy poverty/access and climate change. The IEA aims to provide all stakeholders with an international view of the world's energy system.

The International Renewable Energy Agency (IRENA)
The International Renewable Energy Agency (IRENA) was founded in 2009 as an intergovernmental organization to promote adoption and sustainable use of renewable energy. With more than 140 states and the European Union as members, IRENA helps countries achieve their clean energy potential and promotes renewable resources and technologies as the key to a sustainable future. In addition to the membership fee, Norway has provided voluntary funds


Bicycles are a common tool for wood collection. PHOTO: LENNY LEPOLA

to certain elements of the IRENA work programme and budget for 2014-2015 including: Planning for the global energy transition; gateway to knowledge on renewable energy; and lighthouses for renewable energy deployment.

The International Energy and Climate Initiative - Energy+
The United Nations Secretary-General and the Norwegian Prime Minister launched the Energy+ partnership in Oslo in 2011. The partnership aimed to support efforts to achieve universal access to sustainable energy and reduce greenhouse gas emissions in developing partner countries by scaling up access to renewable energy sources and increasing energy efficiency. The Energy+ Guiding Principles focused on strengthened governance and comprehensive sector programmes with the following aims and features:

- Sector programmes to reduce transaction costs and facilitate increased public and private investments in clean energy and energy efficiency.
- Combined focus on achieving increased access and reduced emissions.
- Result based financing, with monitoring and verification of results.

Fifty-five countries and organizations subscribed to the Energy+ Guiding Principles. The most

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advanced programme pilot was in Ethiopia and Bhutan, but plans for implementation were also in place in Nepal, and in the early stages in Liberia and Kenya.

Support through Energy+ has gone, for example, to the Clinton Climate Initiative and the 1 Gigaton Coalition 8 (Box 1). This has contributed towards new thinking concerning sector-wide support, results-based financing and ways to leverage private investments.

The Norwegian Government decided to discontinue the Energy+ initiative in 2015 on the basis that the establishment of SE4All reduced the need for the initiative and it was challenging to leverage additional financial support for it. However, Norway continues to support the underlying principles and approaches.

BOX 1

The 1 Gigaton Coalition is established as a voluntary framework to measure and report reduced GHG emissions in developing countries. Renewable energy and energy efficiency programmes in developing countries are reducing GHG emissions without being measured or reported. The Coalition's inaugural report, *"Narrowing the Emissions Gap: Contributions from renewable energy and energy efficiency activities"*, launched at COP21, finds that actions on renewable energy and energy efficiency in developing countries can reduce emissions by 1.7 Gt/year by 2020.

4 Support to Multilateral Organizations and Programmes

» **Channelling financing** through multilateral organizations can provide developing countries with access to technical services and financial instruments on a scale that a single donor cannot accomplish. For example, the World Bank and other large multilateral development banks can leverage financing and provide concessional loans and guarantees to enable large infrastructure investments. These organizations can combine the ability to provide such financial instruments with technical knowledge and a network often providing access to relevant ministries and finance institutions along with other stakeholders.

Cheves Hydropower project Peru. PHOTO: KEN OPPRANN

PREVIOUS VIEW

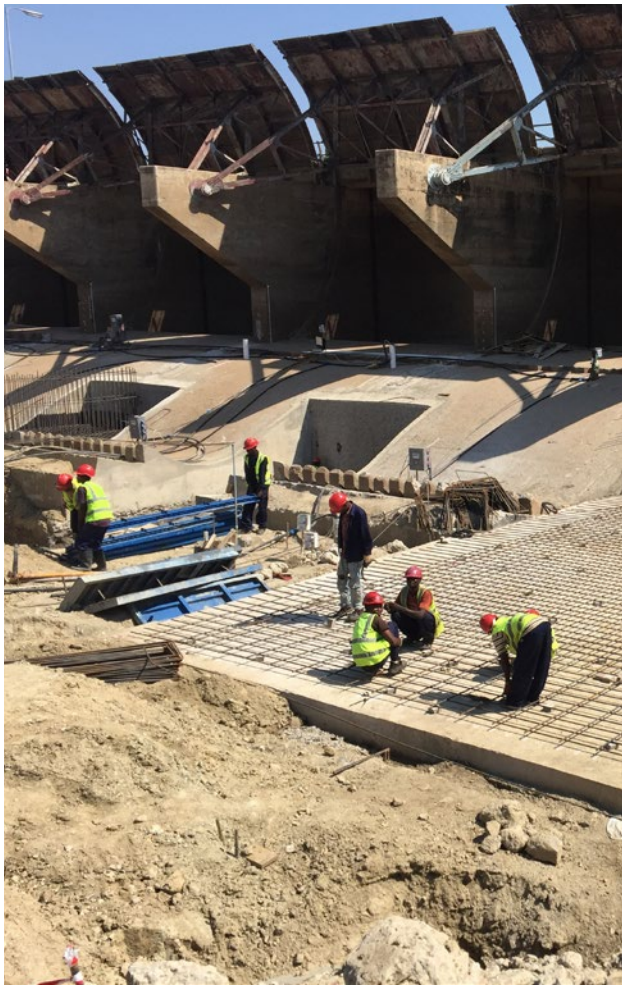
Although the main multilateral instruments for Norwegian energy support are the development banks, Norway also provides support through the United Nations and other multilateral, or international, energy programmes. The United Nations' specialized agencies and development committees have an important function in facilitating political dialogue on international energy issues.

Norway works closely with multilateral organizations with the joint goal of contributing effectively and efficiently to sustainable development. Along with other members, Norway also takes an active role on the organizations' boards, particularly emphasizing support to poor countries and fragile states, gender equality, results management and improved reporting.

Norwegian support to energy through multilateral channels amounts to NOK 3.3 billon between 2007 and 2015. This total includes NOK 1.4 billion earmarked for energy programs and NOK 1.9 billion as the energy share of core support to Multilateral Development Banks.

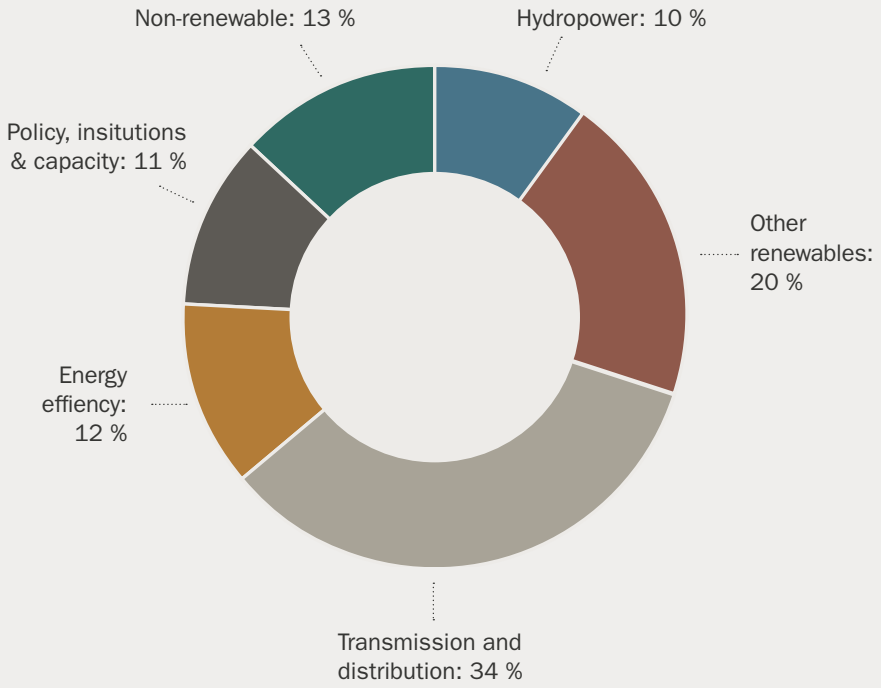
MULTILATERAL DEVELOPMENT BANKS – CORE SUPPORT

The largest multilateral development organizations engaged in the energy sector in developing and emerging economies are the World Bank Group (WBG), Asia Development Bank (ADB), and Africa Development Bank Group (AfDB). In the period 2007-2015, these banks have provided access to electricity to more than 100 million households (about 500 million people), access to improved cook stoves to 20 million households and constructed nearly 500 000 km transmission and distribution lines. Norway provides both "core" and "earmarked" funding to these banks. A brief description of the banks and their overall energy sector investments in recent years is presented below.



Concrete works at the Kamuzu barrage rehabilitation project in Malawi.
PHOTO: FRIDA MARTINSSON / MULTICONSULT

FIGURE 3 // DISTRIBUTION OF SUPPORT WBG 2007 – 2015

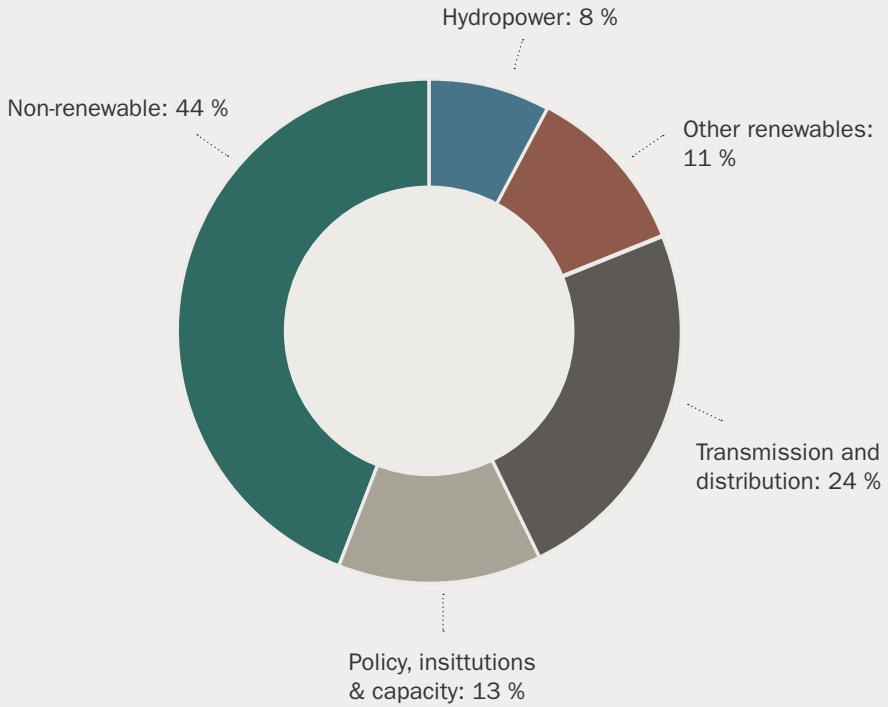


WORLD BANK GROUP

The World Bank Group (WBG), through the International Bank for Reconstruction and Development (IBRD), the International Finance Corporation (IFC), and the International Development Association (IDA), has invested USD 55 billion in total in the energy sector since 2007. This is equivalent to approximately 11 percent of overall investments made by the WBG in this period. The main areas of investment were solar, hydro and wind power. The WBG also provided substantial amounts of loans, investments and policy advice in geothermal power, biomass energy, hybrid systems, transmission lines, and energy efficiency.

SOURCE: WBG

FIGURE 3 // DISTRIBUTION OF SUPPORT AFDB 2007 – 2015



The Africa Development Bank Group (AfDB) allocated more than USD 1 billion in lending to public and private energy sector projects in 2015. With an energy portfolio of over USD 11 billion, AfDB investments have contributed to an estimated 145 million people gaining access to electricity since 2000. Interventions range from large-scale generation and regional infrastructure projects to decentralized solutions to maximize inclusive energy development. AfDB also hosts the Sustainable Energy for All (SE4ALL) Africa Hub in partnership with the African Union Commission, NEPAD and UNDP. It also hosts the Secretariat to the African Energy Leaders Group.

SOURCE: AfDB

PREVIOUS VIEW

The Asian Development Bank (ADB) has been providing assistance to its developing member countries in the energy sector for more than 40 years. The bank invested USD 2.5 billion in clean energy projects across Asia and the Pacific in 2015. ADB's 2009 Energy Policy emphasizes energy security, facilitating a transition to a low-carbon economy, and universal access to energy for achieving ADB's vision of a region free of poverty. ADB is looking to broaden support for greater energy access, not only financially, but also by identifying innovative solutions and tapping the power of the private sector. The bank is promoting energy sector reform, capacity building, and governance, and is assisting entrepreneurs to create business models.

The Nordic Development Fund (NDF) was established in 1989. With amendments of its by-laws in 2009, NDF has a mandate to utilize the capital from repayments for grant support to low-income countries to facilitate investments relevant for climate change mitigation and adaptation. The capital base from the 190 credits provided by NDF during 1989-2005 will amount to approximately one billion Euro during a period of 35 years. Nordic Development Fund (NDF) provides mainly grant financing for both climate change mitigation and adaptation projects, with focus on mobilising private investments.

Energy is a priority sector for all the supported banks, attracting a significant proportion of the available funds. The Norwegian core support going into clean energy investments is distributed across a range of energy technologies, capacity building, institutional, policy and normative work, as allocated by the banks. Based on the actual share of clean energy investment in the banks' total lending operations, Norwegian untied funding to clean energy is estimated to NOK 1.9 billion in the period 2007-2015 (table 2).

Table 3 summarises the key quantifiable results of the Banks' lending operations and estimate the portion of these results attributed to Norway based on the official ownership share.

Further information regarding these results are documented and available on the banks' respective websites.

* The aggregate number made available by the banks does not present a complete picture of archived results. Important gaps include ADB results prior to 2013 and access numbers for the whole period and AfDB generation results.
** Based on simplified ownership share of 1% in the WBG and actual ownership shares in AfDB and ADB.
*** "Improved electricity services" to 20 million customers comes in addition to this.

TABLE 2 // MULTILATERAL DEVELOPMENT BANK CLEAN ENERGY LENDING

BANK	Clean Energy Financing provided in 2007-2015			
	Bank financing for clean energy	Share of total lending	Norwegian core support	For energy
WBG	USD 487 billion	11 %	NOK 8 614 million	NOK 986 million
AfDB	USD 133 billion	10 %	NOK 5 137 million	NOK 530 million
ADB	USD 118 billion	33 %	NOK 638 million	NOK 210 million
NDF	EUR 235 million	28 %	NOK 597 million	NOK 169 million
Total Norwegian core funding for Multilateral Development Bank clean energy lending				NOK 1895 million

TABLE 3 // MULTILATERAL DEVELOPMENT BANKS AGGREGATE RESULTS* AND ESTIMATED NORWEGIAN SHARE**

RESULTS ACHIEVED 2007-2015		NORWEGIAN SHARE	
Electricity Access	500 mill persons (WGB)	5 000 000	5.27 mill people
	18 mill persons (AfDB)***	278 000	
Generation	6 092 MW Renewable (WBG)	60	94 MW
	10 000 MW new power (ADB)	34	
Transmission & distribution	450 000 km lines (WBG)	450	953 km lines
	40 000 km lines (AfDB)	482	
	6 380 km lines (ADB)	21	

BOX 2

Multilaterals financing solar power for 1 million households in Morocco

In February 2016, King Mohammed VI officially opened the first 160 MW Noor-Ouarzazate Concentrated Solar Power complex, which generates enough electricity for 330 000 households. At the same time, he also broke ground for the next 200 MW phase of construction. A third 150 MW phase, which will be operational by 2018, has also reached financial close. The plant will then provide electricity to more than 1 million people, and be the largest Concentrated Solar Power (CSP) plant in the world.

A number of multilateral financial institutions and trust-funds have supported the project including:

- A USD 43 million grant was provided in initial support from the Global Environmental Facility (GEF), to accelerate cost reduction, support commercial adoption and formulate strategies to replicate solar thermal technology elsewhere.

- The first phase was financed through commercial equity, including USD 20 million from International Finance Corporation (IFC), the World Bank Group`s private sector arm. IFC's due diligence and reputation helped mobilize other private investors. Concessional loans, including USD 197 million from the WB managed Climate/ Clean Technology Fund and USD 475 million from the African Development Bank and other multilateral financial institutions, helped reduce project costs by about 20 per cent compared to financing available from commercial banks.

The first 160 MW of Noor-Ouarzazate Concentrated Solar Power complex. PHOTO: WORLD BANK

The World Bank is supporting the next two phases with financing of USD 638 million, including USD 238 million from the Climate/Clean Technology Fund. The African Development Bank is also a major funder of the next two phases. In effect, the multilateral development banks are involved with more than 1 billion of the total USD 2.4 billion of financing for all three phases, as well as providing technical advisory services. The Noor-Ouarzazate complex currently being built will be operated as a public-private partnership. The private partner, the International Company for Water and Power Projects (ACWA Power International), was selected through a competitive bidding process.

MULTILATERAL DEVELOPMENT BANKS - "EARMARKED" SUPPORT

In addition to the core support presented above, Norway directly supports a number of energy programmes and initiatives managed by the banks.

TABLE 4 // ENERGY-SPECIFIC BANK PROGRAMMES SUPPORTED BY NORWAY IN THE PERIOD 2007-2015

BANK	PROGRAMME/DESCRIPTION	NORWEGIAN SUPPORT (NOK MILLION)
WBG & regional development banks	Scaling up Renewable Energy in Low-Income Countries (SREP).	700
WBG	Energy Sector Management Assistance Program (ESMAP)	105
WBG	Trust Fund for Private Sector and Infrastructure, including ESMAP and Lighting Africa	171
ADB	The Clean Energy Financing Partnership Facility	220

BOX 3

» Readiness for Investment in Sustainable Energy (RISE) is a World Bank/ESMAP analysis of 110+ countries, with specific RISE indicators to assess the investment climate for renewable energy. RISE aims to be "actionable" by focusing on what is under national policymakers' control. RISE also aims to provide comparable information, whilst being context neutral, reflecting best practice across countries. Norway supports RISE analysis through both ESMAP and SREP.

ENERGY SECTOR MANAGEMENT ASSISTANCE PROGRAM (ESMAP)

ESMAP is a global knowledge and technical assistance programme managed by the World Bank. It provides analytical and advisory services to low- and middle-income countries to increase their "know-how" and institutional capacity to achieve sustainable energy solutions. Norway is one of 12 donors and have contributed NOK 105 million since 2010.

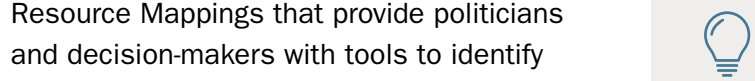
Analytical and advisory services from ESMAP are important for the energy lending operations of the World Bank Group. For example, in the preparatory phase of the Moroccan Concentrated Solar project (see box 2 above), ESMAP has been key for preparations, providing engineering and procurement advisory services, and carrying out a study on gender and socio-economic impacts to inform mitigation and benefit sharing strategies.

ESMAP is also contributing to developing global approaches to mobilize commercial investments. This includes the new Multi-Tier Framework for measuring energy access under the Global Tracking Framework for SE4All, making available assessments of countries' energy investment climate through the Readiness for Investment in Sustainable Energy (RISE box 3), and developing methodologies for results-based financing.

Key achievements include:

- Developing National Renewable Energy Resource Mappings that provide politicians and decision-makers with tools to identify potential renewable energy resources. The programme started in 2013 and is now engaged in 12 countries. In Tanzania, for example, small hydro mapping shows more than 70 promising sites.
- Providing critical financing and knowledge (e.g. Market Trends Reports) for Lighting Africa's key market enabling activities, resulting in the programme's expansion.
- Assisting countries reduce fossil fuel subsidies. Twenty-one countries are supported or in the process of designing subsidy reduction programmes.
- Identifying barriers to private sector investments in renewable energy at the country level, so that governments with a political will to prioritize this can do something about it.

BOX 4



» **Lighting Africa (LA)** is a joint programme of the World Bank and IFC that aims to replace kerosene lamps with LED lamps. LA aims to deliver modern energy services via off-grid solar solutions, and provide quality assurance through testing and standardization. The programme operates in 12 countries and has become a benchmark quality in the pico-PV market. There are over 19.5 million beneficiaries of certified products since 2011 through the LA programme.

SCALING UP RENEWABLE ENERGY PROGRAMME (SREP)

Established in 2010, the Scaling-up Renewable Energy Programme (SREP) aims to demonstrate the economic, social and environmental viability of low-carbon development pathways in the energy sector by creating new economic opportunities and increasing energy access using renewable energy. Since its establishment, ten donors have contributed grant financing to provide SREP with a working capital of around NOK 6.7 billion. Of this, Norway has contributed NOK 700 million. Over the past five years, the number of SREP pilot countries has increased from six to twenty-seven.

By the end of 2015, the SREP Sub-Committee had endorsed investment plans for 18 pilot countries, with an indicative investment allocation of more than USD 700 million plus USD 92.4 million allocated for a private sector. Private sector initiatives are expected to secure co-financing at a leverage ratio of 20:1.

Anticipated results from endorsed investment plans and private sector initiatives are:

- 1 663 MW of new renewable capacity, providing 6 502 GWh of electricity generated per annum
- 16.8 million beneficiaries to gain improved access

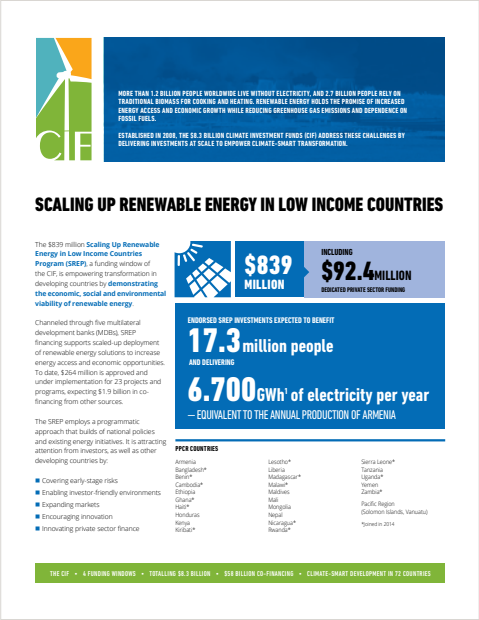
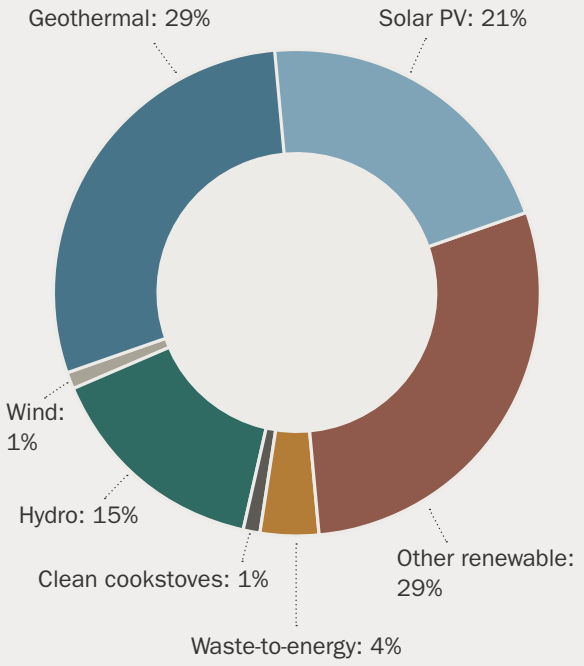


FIGURE 4 // APPROVED SREP FINANCING BY TECHNOLOGY



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BOX 5 // DIVERSIFYING THE ELECTRICITY GENERATION MIX WITH SUPPORT FROM SREP

Tapping Ethiopia's geothermal potential

Ethiopia is working to tap its estimated 5000 MW of geothermal power potential. With SREP support, Ethiopia is developing a long-term geothermal energy strategy and investing in expansion of the Aluto Langano steam field to demonstrate the technical and commercial viability of Ethiopia's geothermal sector.

USD 1.5 million of SREP funds are channelled through the International Finance Corporation (IFC) to support this effort with technical assistance to draft or revise geothermal laws and regulations to provide a strong, transparent regulatory framework and a sustainable operational and institutional structure to govern private power generation.

USD 24.5 million of SREP funds are channelled through the World Bank to help cover the costs of surface exploration, drilling consumables, technical assistance, and capacity building needed to develop 70 MW new geothermal capacity at the Aluto Langano Geothermal Plant.

With these interventions, SREP aims to diversify the electricity generation mix in Ethiopia and thereby improve reliability of supply, which is currently heavy on hydropower. The SREP projects are expected to improve access to electricity for 1.1 million people, of whom more than 70 percent will be new customers.

THE CLEAN ENERGY FINANCING PARTNERSHIP FACILITY (CEFPF)

The Asian Development Bank's Clean Energy Financing Partnership Facility (CEFPF) aims to increase investments in and access to technology for clean energy. The facility also contributes to develop policy, implement reforms, strengthen institutional capacity as well as facilitate private sector investments in the field of clean energy. Norway has contributed NOK 220 million to the fund since 2007.

According to the 2015 annual report, USD 138 million has been disbursed to 131 projects in 35 countries since 2007. This is expected to leverage USD 2.16 billion of clean energy investments, USD 842 million in private sector and USD 870 million for non-private sector investment. In 2015 alone, the facility was able to leverage USD 197 million for clean energy projects.

To date, the facility has contributed to energy savings equivalent to 6.7 TWh, 733.6 MW new installed renewable energy capacity producing 3.2 TWh each year, and mitigation of annual greenhouse gas emissions equal to 7.6 million tons of CO2. A recent evaluation found that the Fund is relevant and effective, with an accumulated leverage ratio of 1:26.

THE UNITED NATIONS - CORE SUPPORT

The Secretary General's Sustainable Energy for All (SE4All) initiative, and the new Sustainable Development Goal on energy (SDG7) strengthen the broad UN engagement on energy issues. Sustainable development Goal Number 7 calls on us to “ensure access to affordable, reliable, sustainable and modern energy for all".

Norway supports the SE4All Initiative as well as UN’s general energy efforts through providing core funding to the different UN agencies. Most UN agencies have an active focus on energy issues as part of their mandates.

For example, **The United Nations Development Programme (UNDP)** assists countries to integrate energy goals into their national development strategies, provides technical advice to develop specific sustainable energy solutions and supports the development of enabling conditions that allow for the transformation of energy markets towards long-term sustainability. **The United Nations Environmental Programme (UNEP)** support countries’ low emission and resource-efficient development pathways and provides tools that comprise and combine policies, technology, and finance availability to improve energy efficiency in key sectors and increase renewable energy in the energy mix. **The World Health Organization (WHO)** monitors effects of indoor and outdoor air pollution, and provides health-based guidance for policy-makers and implementers on fuels and energy technologies used in the home, for example for clean cookstoves.

The Food and Agriculture Organization (FAO) promote bioenergy in agriculture value chains and focus on energy and water issues to achieve food security and sustainable development.

TABLE 5 // TABLE UN FUNDS WITH FOCUS ON ENERGY SUPPORTED BY NORWAY IN THE PERIOD 2007-2015

PROGRAMME/DESCRIPTION	TOTAL FUNDING NOK MILLION	ENERGY SHARE NOK MILLION	NOTE
UN Global Environmental Facility (GEF)	990	198	Norway provides approximately 2% of total GEF funding, of which 20% is targeted to energy-related projects.
UNDP Thematic Trust Fund for Energy and Environment (EE TTF)	165	82	Norway provides approximately 25% of total EE TTF, of which 50% is targeted to energy-related projects.

THE UNITED NATIONS - «EARMARKED» SUPPORT

Norway has also been a major contributor of earmarked funding to clean energy interventions under the UN Global Environmental Facility (GEF) and UNDP as detailed in Table 5 and the following two subchapters.

The Global Environmental Facility (GEF)

The Global Environment Facility (GEF) was created

at the 1992 Rio Earth Summit to support measures that provide global environmental benefits and as a financing mechanism for the UN Conventions on Climate Change, Biological Diversity and other environmental issues.

Since its inception, GEF has allocated over USD 12.5 billion to about 3 700 projects and programs in 165 countries. GEF project activities have triggered about USD 58 billion in co-financing from other resources. Renewable energy and energy efficiency is a significant part of GEF's portfolio to mitigate climate change, and about 20% of GEF's overall program.

Key results from GEF's effort to support for expansion of renewable energy supply and improvements in energy efficiency between 2007 and 2015 include:

- 541 million tonnes of GHG reductions from 276 supported renewable energy projects
- 422 million tonnes of GHG reductions from 242 energy efficiency projects

UNDP Thematic Trust Fund for Energy and Environment (EE TTF)

The Environment and Energy Thematic Trust Fund (EE-TTF) facilitated UNDP's work on sustainable energy across many developing countries. It supported a range of multi-partner sustainable energy programmes, which included the creation of the Millennium Development Goal (MDG) Carbon Facility in 2007 as well as technical assistance to various countries.

MDG Carbon Facility provided capacity development for the Clean Development Mechanism (CDM) in Africa, Central Asia and Latin America, as well as technical assistance to developers of energy projects to show how carbon finance can be leveraged for sustainable development. A total of 34 projects were implemented in 22 countries to secure carbon financing for renewables, emission reductions and energy efficiency. Expected results from the assessment of two of the projects under implementation include:

- 10 000 households provided with access to improved cook stoves
- Solar photovoltaic power plants with an installed capacity of 400MW commissioned
- Dissemination of 800 000 efficient compact fluorescent lamp bulbs

Also, 15 countries in sub-Saharan Africa and 11 in South and South-East Asia have received direct support from the EE-TTF. Results include providing 2.5 million households in sub-Saharan Africa with access to mechanical energy services since 2010.

OTHER MULTILATERAL PROGRAMMES

Norway also supports a few multilateral programmes that are not under the purview of the banks or the UN, as detailed in table 6.

TABLE 6 // MAJOR MULTILATERAL ENERGY PROGRAMMES SUPPORTED BY NORWAY IN THE PERIOD 2007-2015

PROGRAMME/DESCRIPTION	EXPENDITURE NOK MILLION
Energising Development (EnDev)	232
Clinton Climate Initiative	23
UN Foundation. Global Alliance on Clean Cookstoves (GACC)	20

Clinton Climate Initiative (CCI)

The Clinton Climate Initiative aims to support authorities and utilities in negotiations with commercial developers, and connects Small Island Development States (SIDS) with financing institutions through the Diesel Replacement Initiative. Many SIDS use considerable financial resources to buy diesel for electricity generation, even as renewable electricity technologies have become more competitive in recent years. A key reason is their lack of capacity to negotiate with commercial developers.

The main results of the Diesel Replacement Initiative supported by Norway are the financial close of a 24 MW wind farm extension project in Jamaica and a 1.3 MW rooftop solar (PV) installation in the Seychelles. These projects leveraged considerable commercial investments (USD 47 million in equity for the wind farm, and USD 1.6 million in grants and co-financing for the solar rooftop project).

Energising Development (EnDev)

EnDev is an energy access partnership working in more than 20 developing countries. It supports i) dissemination of clean cookstoves and biogas, and ii) grid and off-grid electrification. EnDev focuses on establishing local markets for modern energy technologies, and has contributed to the dissemination of modern energy technologies to more than 15 million people.

EnDev has worked closely with ESMAP on the development of the multi-tier framework for energy access for cooking, as it has contributed to the electricity multi-tier framework in support of the Global Tracking Framework (GTF). EnDev also contributes to the development of ISO standards for clean cook stoves and clean cooking solutions. Since 2014, EnDev (with support of the UK Department for International Development, DFID), has been piloting results-based-financing.

Key results since 2005[2] include:

- 11.7 million people provided with clean Cookstoves and 3.8 million people given access to electricity
- More than 17 800 social institutions and 34 000 small enterprises provided sustainable access to modern energy services
- 37 000 stove builders, craftsmen, vendors and solar technicians trained
- 1.7 million tonnes of CO2 emission reductions per year

Global Alliance on Clean Cook Stoves (GACC)

The Global Alliance for Clean Cook Stoves (GACC) is a public-private partnership that seeks to save lives, improve livelihoods, empower women, and protect the environment by creating a thriving global market for clean and efficient household cooking solutions.

Significant progress has been reported for the period 2010–2015. To date, more than 20 million clean cook stoves have been supplied, and global awareness has grown significantly regarding the serious health, environmental, and livelihood issues posed by household air pollution. The Alliance is actively driving investment in the sector, supporting capacity building for entrepreneurs, enhancing testing and knowledge centres, and engaging in new research in dozens of countries where national policies are identifying clean cooking solutions as integral to achieving improvements in energy access, women and children's health, and the environment. This is most evident in the Alliance's eight focus countries of Bangladesh, China, Ghana, Guatemala, India, Kenya, Nigeria, and Uganda where the Alliance has been instrumental in developing and shaping country action plans for further progress. The Alliance's leadership has also been influential in the process to create the first-ever global standards for cook stove safety, efficiency and cleanliness.

Production of clean cookstoves. PHOTO: LENNY LEPOLA

2 Norway has supported this programme since 2012. In this period, results have been: Electricity access – 2.95 million people, Clean cooking / thermal energy – 7.52 million people (Norway has contributed 10% of total financing in this period).

5 Commercial investments

» **Available public funds** are insufficient to meet the large investment needs of developing countries' generation capacity. Mobilizing commercial capital is therefore a key priority.

PHOTO:NORFUND

PREVIOUS VIEW

Norway supports a number of initiatives to attract commercial investment. These include institutional strengthening, development of investment plans, and so on, but also commercial investment instruments and facilities directly aimed at mobilizing commercial investments in electricity generation through the provision of risk capital, guarantees, or subsidies as described in this chapter.

Through support to commercial investment instruments, Norway has contributed to investments of at least around 6000 MW new installed capacity. As Norway is one of several donors/investors, Norway contributes towards leveraging investment through these instruments; the result, therefore is not fully attributable to Norwegian support. A significant increase in this result is expected in the future due to the long gestation period for developing power plants. The support has also resulted in facilitating investment by, for example developing a standard Power Purchase Agreement through the GET FiT programme in Uganda.

TABLE 7 // NORWEGIAN SUPPORT TO KEY COMMERCIAL INVESTMENT INSTRUMENTS IN THE PERIOD 2007-2015

PROGRAMME/DESCRIPTION	PERIOD	EXPENDITURE NOK MILLION
Private Sector Development, Norad	2007 – 15	236
Norfund	2007 – 15	6 500
GET FiT, Uganda (Implementing partner KfW)	2013 – 15	140
European Investment Bank. Global Energy Efficiency and Renewable Energy Fund	2008 – 14	110
International Finance Corporation (IFC), Catalytic Fund	2014	102
IFC Trust Fund for Sustainable Business Advisory Services with a focus on clean energy	2010	5
UNEP, Renewable Energy Performance Platform	2012 – 2015	5
Private Infrastructure Development Group – Green Africa Power	2014 – 2016	123

Commercial investments amount to more than 40 percent of the total Norwegian energy development assistance in the period. These are expected to be paid back, generate a return and be re-invested.

PRIVATE SECTOR DEVELOPMENT, NORAD

The Section for Private Sector Development in Norad has supported renewable energy projects in developing countries since the early 1990s with loans and grant support for feasibility studies, training and infrastructure. When Norfund was established in 1997, Norad's loan portfolio was transferred to Norfund. Over time, Norad has increasingly emphasized support for feasibility studies undertaken by companies in the private sector.

For private investors and commercial investors such as Norfund, the project must be proven to be financially, technically and environmentally feasible. Therefore, Norad's financial support for feasibility studies to determine potential power generation projects for private investors in the pre-investment phase is complementary to Norfund's investment facility. Norad's support has facilitated private investors and financial institutions to invest, resulting in new solar and hydro power production capacity in Africa, Asia and Central-America.

BOX 6 // LONG TERM SUPPORT TO LAOS

Support to Laos from the Private Sector Development section has been instrumental in developing Lao's energy sector since the early 1990s. This support aimed to modernize the water resource management and electricity legislation, and to promote development of the country's hydropower potential. Norad financed feasibility studies for several hydropower plants and then supported the development and construction phase, with new installed capacity added to the Laotian electricity grid. Norad also co-financed a rural electrification programme with the World Bank. Completed in 2015, more than 47 000 new households were electrified, exceeding the target outcome.

BOX 7 // SUPPORT TO FEASIBILITY STUDIES

SunErgy AS is a Norwegian company dedicated to providing communities in emerging markets with off-grid solar power through turnkey small-scale solar power plants. Bundled with electricity, SunErgy also offers cable TV and internet access. In May 2012, the company entered into an agreement with the Republic of Cameroon to provide ninety-two villages with some 115 000 families, altogether 600 000 people, plus schools. Health centres, private and public enterprises, etc. The company has received support from Norad to carry out feasibility studies for the project.

Solar PV and hydro power projects currently in the stages between feasibility study and financial closure or under construction,add up to more than 1 000 MW in plannet generation capacity.

Activities supported by Norad's Section for Private Sector Development, for example in Bhutan, India, Nepal, and Uganda, are integrated throughout the bilateral chapter of this report.

It also important to note that a number of projects do not materialize after the feasibility study is complete, often because they are not found to be technically or financially viable. Investors thereby avoid costly investment mistakes, freeing up capital for good projects. This is an important result, but one that is difficult to measure.

Few grant schemes are available for project development. An external reiew of Norad's support to private sector renewable energy projects between 2007 and 2015 found the grant scheme very useful to reduce risk in the early stages of an investment.

Nkusi small hydro project. Hoima/Kibale, Uganda. PHOTO: FREYER

NORFUND

The Norwegian Investment Fund for Developing Countries (Norfund) is a government-owned Development Finance Institution, and is Norway's main instrument for leveraging commercial investments. Its purpose is to contribute to building sustainable commercial businesses in developing countries. Norfund provides equity, other risk capital, and loans to companies in selected countries and sectors where businesses lack access to sufficient capital to develop and grow. Norfund's total investment in clean energy in the period 2007-2015 was NOK 6.5 billion. This figure includes all projects invested in from 2007 to 2015, including projects that were exited in the period, investments in project development and follow-on investments in projects from before 2007.

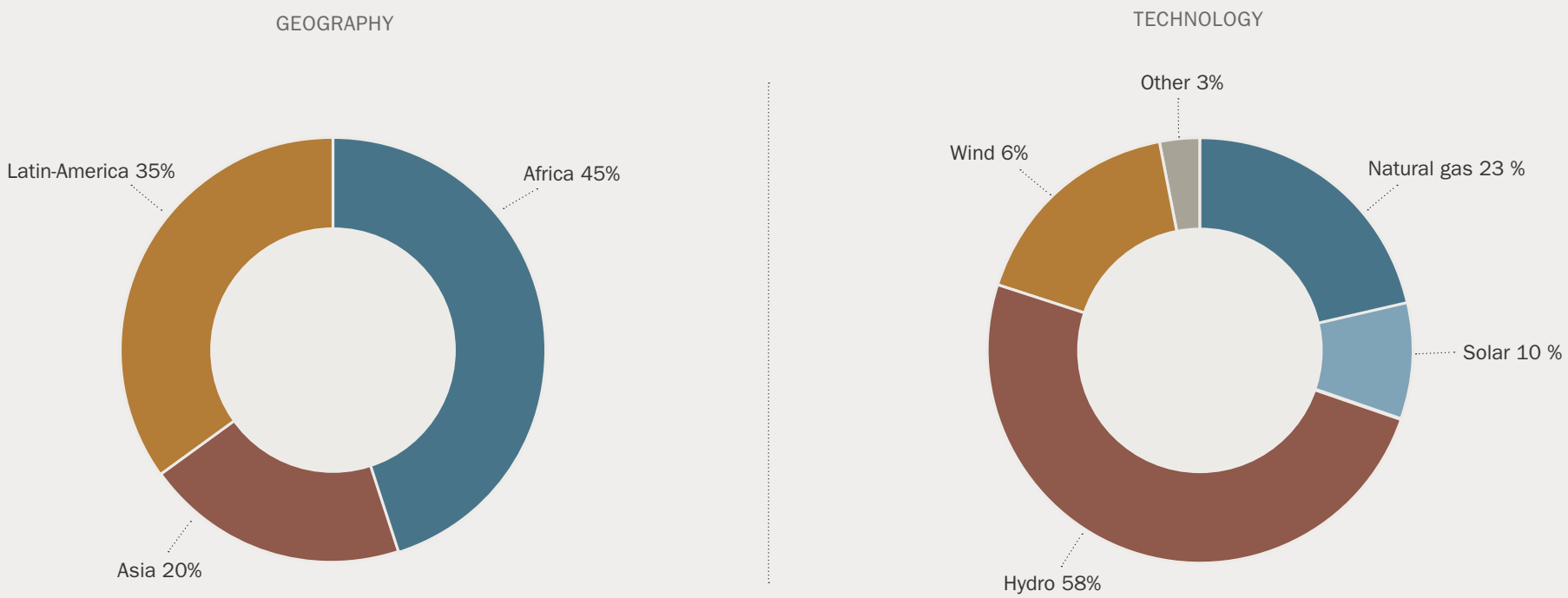
KEY RESULTS 2007–2015

Generation

Hydro power:	2 726 MW
Wind power:	933 MW
Solar power:	492 MW
Natural gas:	1 172 MW
Other:	165 MW

Solar plant in Rhanda. PHOTOS: NORFUND

FIGURE 6 // NORFUND INVESTMENTS 2007 – 15 BY GEOGRAPHY AND TECHNOLOGY



During the period 2007-2015 Norfund invested in 47 energy projects[3] and/funds resulting in about 5 300 MW total installed capacity including projects under construction, with an average annual production of 23 179 GWh (equal to 18 per cent of total Norwegian consumption). More details on the Norfun investments portfolio can be found at norfund.no

3 This figure includes sub-projects of companies such as SN Power/SKIHI and Globeleq. The figure does not include holding companies or project developments funds as these projects do not have production. Norfund has invested in 11 PDFs. Norfund has also invested in one fund, ICCF.

While hydropower historically has dominated Norfund's energy-portfolio, solar and wind energy have become more competitive and account for an increasing portion of total investments (see figure 6). To date, 250 MW of solar power has been built with Scatec Solar. This figure is expected to increase significantly going forward. Investments in wind power are also expected to grow. Norfund's strategy focuses on working with industrial partners to build and deploy the required competence for the success of these projects.

Developing commercially financed infrastructure in fragile states is extremely challenging, as seen through Norfund's activities in South Sudan. Institutional frameworks are sometimes weak, and the macro-economy is as fragile as the political establishment. However, in keeping with its mandate, Norfund continues to seek investments in fragile states.

BOX 8 // DIRECT INFRASTRUCTURE INVESTMENTS

Electricity from 25 000 cattle in South-Africa

A new Bio2Watt 4.4 MW biogas plant commissioned in 2007 in South Africa produces electricity from organic waste. The plant helps reduce both the nation's electricity deficit and the amount of landfill waste and is South Africa's first industrial scale biogas waste-to-energy operation. The plant processes 200-300 tonnes of waste every day to produce electricity. This waste includes manure from 25 000 cattle (the plant is located on the premises of one of the country's largest feedlots), as well as organic waste from the local municipality and nearby industries. Under a 10-year power purchase agreement, the electricity is sold directly to the car manufacturer BMW South Africa. The agreement is the first of its kind in the country: an independent power producer selling electricity directly to a private customer, instead of the state-owned utility, Eskom. The BMW factory receives 25-30% of its electricity from Bio2Watt.

Through its Project Development Facility, Norfund committed a convertible loan to fund the last part of Bio2Watt's project development up to its financial closure stage reached in early 2014. Norfund then provided around one third of the equity capital required for the project. The plant started electricity production in October 2015.

Bio2Watt biogas plant PHOTO: KAROLINE TEIEN BLYSTAD

BOX 9 // DIRECT INFRASTRUCTURE INVESTMENTS

Investing in Africa's largest wind power plant

Norfund and the Norwegian pension fund KLP are part of the international consortium financing the 310 MW Lake Turkana Wind Power project in Kenya. When complete in 2017, it will be the largest wind power plant in Africa, and provide up to 20 percent of Kenya's annual electricity needs. The site, covering 40 000 acres (162 km2), is located in Marsabit West County – a dry, remote, and historically marginalized area in north-eastern Kenya, with absolute unique wind resources for a wind power plant.

"Wind power varies depending on the time of day," said Mugo Kibati, Chairman of the Lake Turkana Wind Power project. "A typical windfarm would have a 25–35 percent utilisation rate. Lake Turkana will have an impressive 62 per cent."

The project will construct 365 wind turbines (each with a capacity of 850 kW), an associated overhead electric grid collection system, and a high voltage substation. A 204 km-long road to link the area to the nearest paved road has been built, as well as an access road network in and around the site for construction, operational work, and maintenance.

The Lake Turkana Wind Power project in Kenya PHOTO: NORFUND

"This area was almost completely forgotten. In addition to generating wind power, the roads that the project is constructing will open up the place and bring in development."

– STAKWEL YURENIMO, LOCAL COMMUNITY LEADER

BOX 10 // DIRECT INFRASTRUCTURE INVESTMENTS

Scatec and Norfund go solar in Rwanda

The Scatec Solar Project in Rwanda is an 8.5 MW solar plant at the Agahozo-Shalom Youth Village. It is the first utility scale solar PV power plant in East Africa. Financed in 4 months – a record for infrastructure projects of this kind – the plant construction was completed just 6 months later. Although the power plant is relatively small compared to Norfund and Scatec Solar's other solar investments, its output is close to 10 percent of the maximum capacity of Rwanda's power grid and the plant is making a significant contribution to meeting the growing demand for power in the country.

Through its rental payments, the project provides financial support to the Agahozo-Shalom Youth Village, a local school for orphans of the Rwandan genocide. Scatec Solar, Norfund, and KLP provided equity for the project. The Dutch development bank FMO and a debt fund for projects in Africa, the Emerging Africa Infrastructure Fund (EAIF), made senior debt financing available.

Norwegian Prime Minister Erna Solberg at the opening of the solar power plant PHOTO: NORFUND

"Generation and provision of electricity to all Rwandans is a priority for the government. This plant produces 8.5 megawatts of clean energy and is an important addition to help close our current energy gap."

– JAMES MUSONI, MINISTER OF INFRASTRUCTURE IN RWANDA

GET FiT UGANDA

GET FIT

The GET FiT (Global Energy Transfer Feed-in Tariff) Program pilot in Uganda aims to fast track about 20 small-scale renewable energy generation projects promoted by private developers through a top-up on the existing feed-in-tariff for the five first years of operation, and provide insurance against off-taker risk. It expects to yield a combined installed capacity of up to 170 MW, or approximately 830 GWh of energy production per year, a national increase of 20%. Furthermore, the programme expects to reduce greenhouse gas emissions by about 11 million tonnes of CO_2 over the 20-year lifespan of PPAs. It will improve access to electricity for at least 200 000 households (about 1.2 million people), and leverage about USD 400 million in private investments using a limited amount of results-based grant funding.

Norway, along with Germany, the UK and the EU are co-funding the programme. The World Bank partial risk guarantee is also a key component. The Norwegian contribution represent about 15% of total financing.

Capacity building and regulatory changes facilitated by GET FiT have played a key role in attracting private investment to the energy sector in Uganda, now considered by Climate-Scope (Bloomberg New Energy Finance) to be the third best destination for renewable energy investments in Africa. Support to standardization of legal documents such as bankable Power Purchase Agreements and Implementation Agreements have been particularly important in attracting investments.

Recognizing the positive experiences with the GET FiT Program in Uganda, public sector stakeholders in other parts of the continent have indicated interest in exploring the potential of similar programmes in their countries. In Zambia, preparations for a GET FiT Programme are advancing well. KfW have also commissioned market assessment studies to consider

Construction on the 6.3 MW Siti I HPP, which is being realized as a consequence of the GET FiT Program PHOTO: FRONTIER INVESTMENT MANAGEMENT

the interest and potential for a GET FiT programme in 10 other countries in Eastern, Southern and Western Africa.

RENEWABLE ENERGY PERFORMANCE PLATFORM

The Renewable Energy Performance Platform (REPP) aims to make available investment instruments for renewable energy projects in Africa. In 2013, Norway provided NOK 4.8 million to develop the platform. The REPP was established in December 2015 and has secured significant initial funding from the UK Government. This funding is to support up to 20 projects leading to 150MW of new installed clean energy capacity over a period of 5 years (2016-2020).

FUND-OF-FUNDS

Norway supports two fund-of-funds, funds that in turn invest in other funds. These fund-of-funds comprise public and private investors sharing the risk. The investments themselves are on commercial terms.

Global Energy Efficiency and Renewable Energy Fund (GEEREF)

GEEREF is a fund-of-funds established in 2008, advised by the European Investment Bank Group. GEEREF aims to catalyze investment in clean electricity generation and energy efficiency projects in developing countries, and maximize their positive environmental, social and developmental aspects. GEEREF has commitments of EUR 222 million, of which about 50% is public (from the European

"We're building Ethiopia's first independent power project in the extinct Corbetti volcano. Once operational, it will produce enough electricity to supply five million Ethiopian homes. Without EIB (GEEREF) it would have been very, very hard to get it off the ground."

– ALASTAIR VERE NICOLL,
FOUNDER OF BERKLEY ENERGY

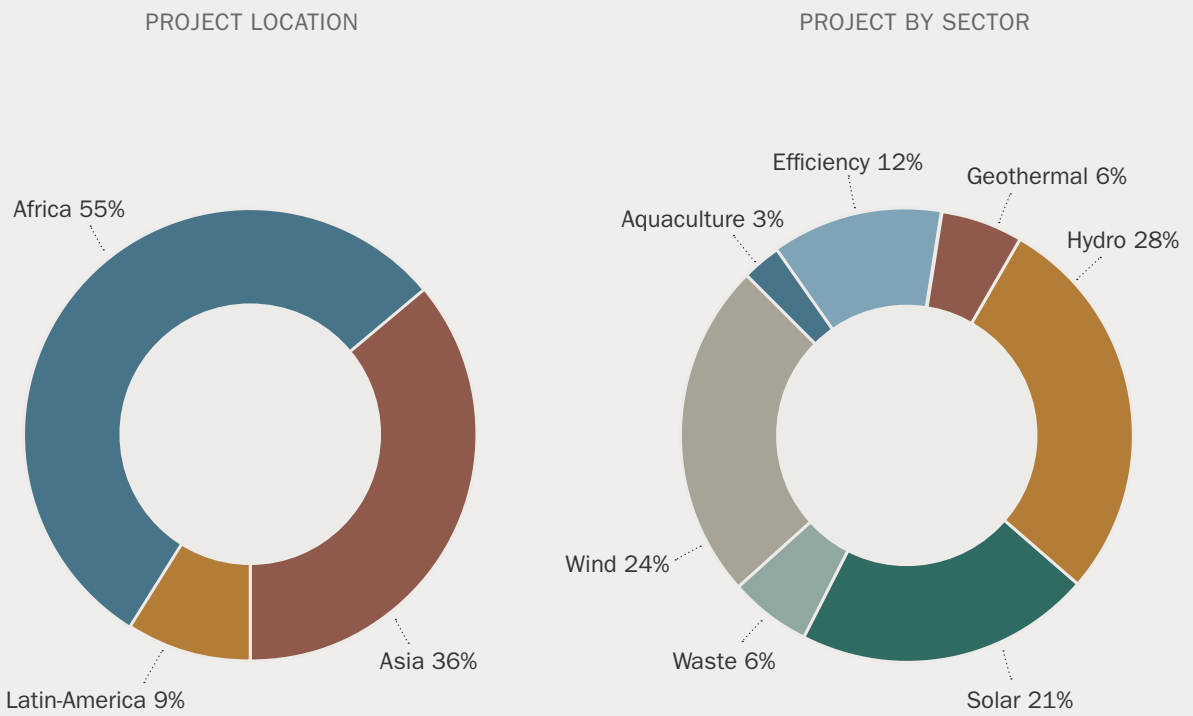
Windpower turbine foundation at Kouga Wind, South Africa. Rotor blades ready for installation in the background. PHOTO: GEEREF

Commission, Germany and Norway) and 50% is private, including investments by pension funds, family offices as well as high net worth individuals. GEEREF's investors are looking for more than just profit maximization from their investments. Norway has contributed NOK 110 million. As of the end of 2015, the Fund has signed commitments to ten portfolio funds. Figure 7 illustrate the portfolio allocation by geography and technology.

The total results of the fund are not yet realized. GEEREF's Investment Period will last until May 2019 and several of the funds it has invested in are still in the process of allocating their capital. However, at the end of 2015, GEEREF published its second Impact Report that documented the following results:

- 1 223 MW of installed capacity
- 4.3 million MWh of electricity generated
- 3 million tonnes of greenhouse gas emissions avoided
- 3.7 million households benefited
- 508 SMEs benefited, and
- Over 2 000 temporary jobs created

FIGURE 7 // THE GEEREFF INVESTMENT PORTFOLIO BROKEN DOWN BY REGION AND TECHNOLOGY

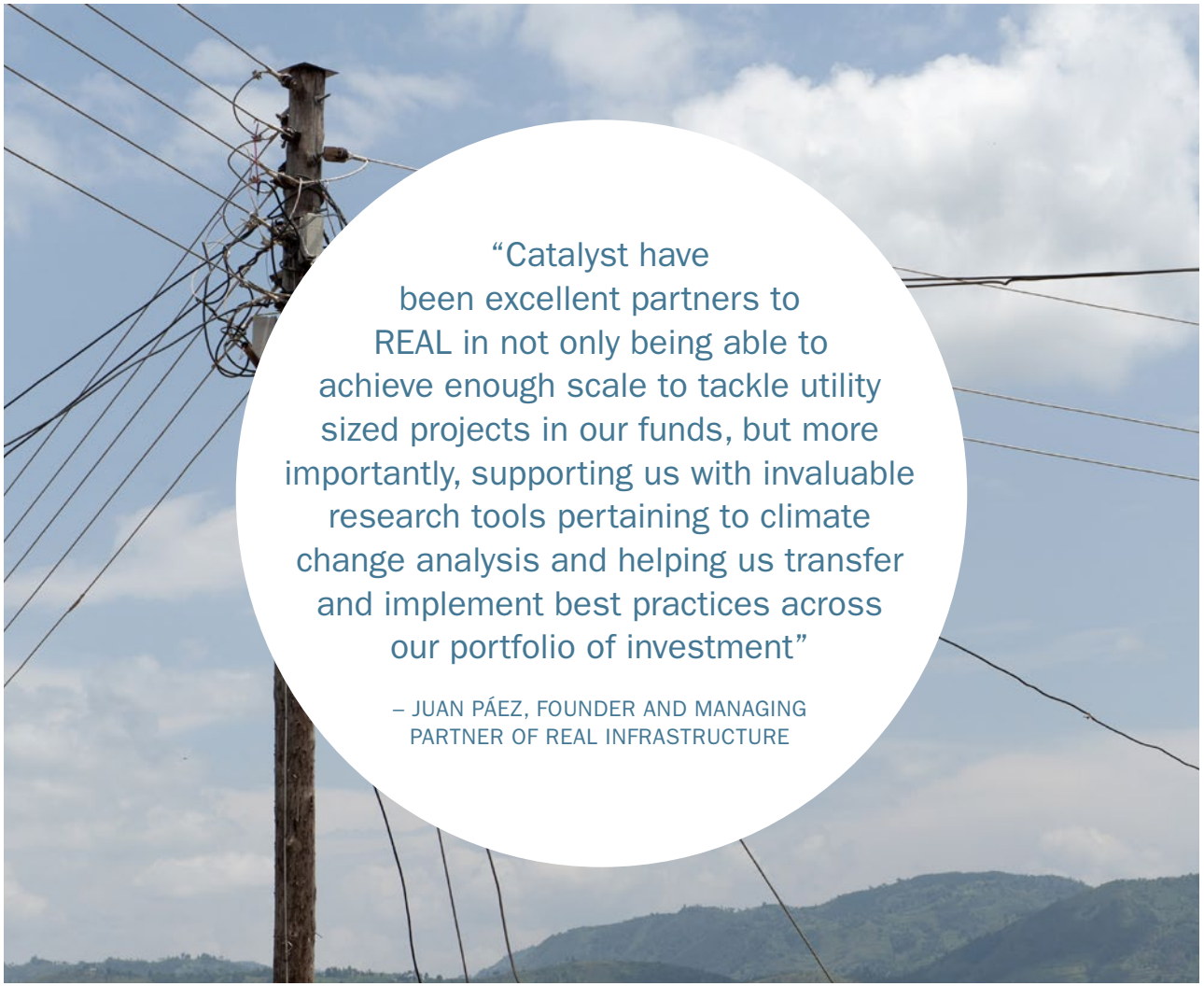


PREVIOUS VIEW

International Finance Corporation (IFC) Catalyst Fund

IFC is the World Bank Group's private sector arm. Its Catalyst Fund is a fund-of-funds established late 2012. The fund aims to mobilize private investments in developing countries for climate friendly projects and companies, including renewable energy, whilst making commercially attractive risk-adjusted returns. The Catalyst Fund has commitments of USD 418 million, of which about 53% is public. Norway contributed NOK 100 million in 2014.

To date, the Fund has invested in nine sub-funds. These have in turn invested in approximately 50 projects. Most of the sub-funds are still in the process of investing their capital and developing projects, but a preliminary evaluation conducted in 2015 showed that the Fund portfolio is on track developmentally and commercially. Any financial returns on the Norwegian contribution will be reinvested in climate friendly development projects within the World Bank Group.



"Catalyst have been excellent partners to REAL in not only being able to achieve enough scale to tackle utility sized projects in our funds, but more importantly, supporting us with invaluable research tools pertaining to climate change analysis and helping us transfer and implement best practices across our portfolio of investment"

– JUAN PÁEZ, FOUNDER AND MANAGING PARTNER OF REAL INFRASTRUCTURE

6 Bilateral support

» This chapter presents the main results from the bilateral cooperation with the partner countries in the period between 2007 and 2015.

Lubilia HPP, Uganda. 5.4 MW, 25 GWh/year. Expected commission end 2017. PHOTO: SVEIN ERIK HÅRKLAU.

Each country has its own context and set of needs. In close dialogue with the partner governments the cooperation programmes are tailored specifically for the different countries, to fit with their priorities and needs, other international partners' programs and in consideration of where Norway best can contribute.

In most countries the bilateral cooperation programs supported by Norway include a mix of support more directly aiming to develop infrastructure or provision of modern energy services, and support aiming to improve the legal and institutional framework or planning and management capabilities through capacity building and technical assistance.

AGGREGATE QUANTIFIABLE RESULTS UNDER THE BILATERAL PART OF THE INITIATIVE 2007 – 2015

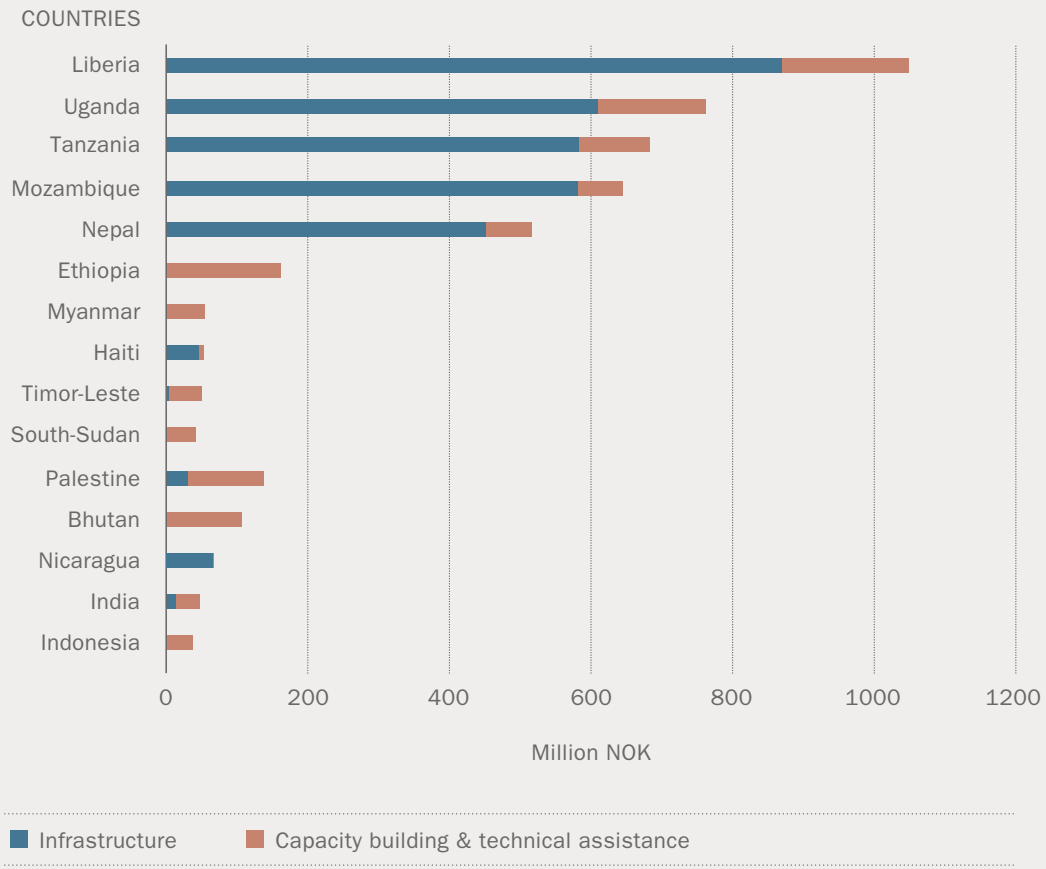
 Access	**Increase in number of households with access to electricity and other modern energy services*:** 115 000 grid extensions, 75 000 expected. 180 000 isolated networks, 300 expected. 660 000 distributed solar home systems. 1 100 000 clean cookstoves and biogas, 10 000 expected.
 Generation**	100 MW installed as a result of grant support, 90 MW expected. 300 MW installed as a result of transactional advisory services or support provided to feasibility studies, 1 500 expected.
 Power grid	700 km transmission lines, 500 km expected. 3 300 km distribution lines, 1 100 km expected.

* Unfortunately, there is no systematic data collection of other customer groups than households, such as businesses, schools, hospitals etc.
** Generation includes both renewable and thermal energy sources.

PREVIOUS VIEW

In terms of funding volume and/or internal administrative and technical resources, support has been concentrated on a few partner countries. Liberia, Uganda, Tanzania, Mozambique, Nepal and Ethiopia have been priority partner countries since the launch of the Clean Energy Initiative in 2007. Haiti, Myanmar and South-Sudan have since been added to this list of priority countries. The results achieved and expected from these cooperation programmes are discussed further in the following chapters.

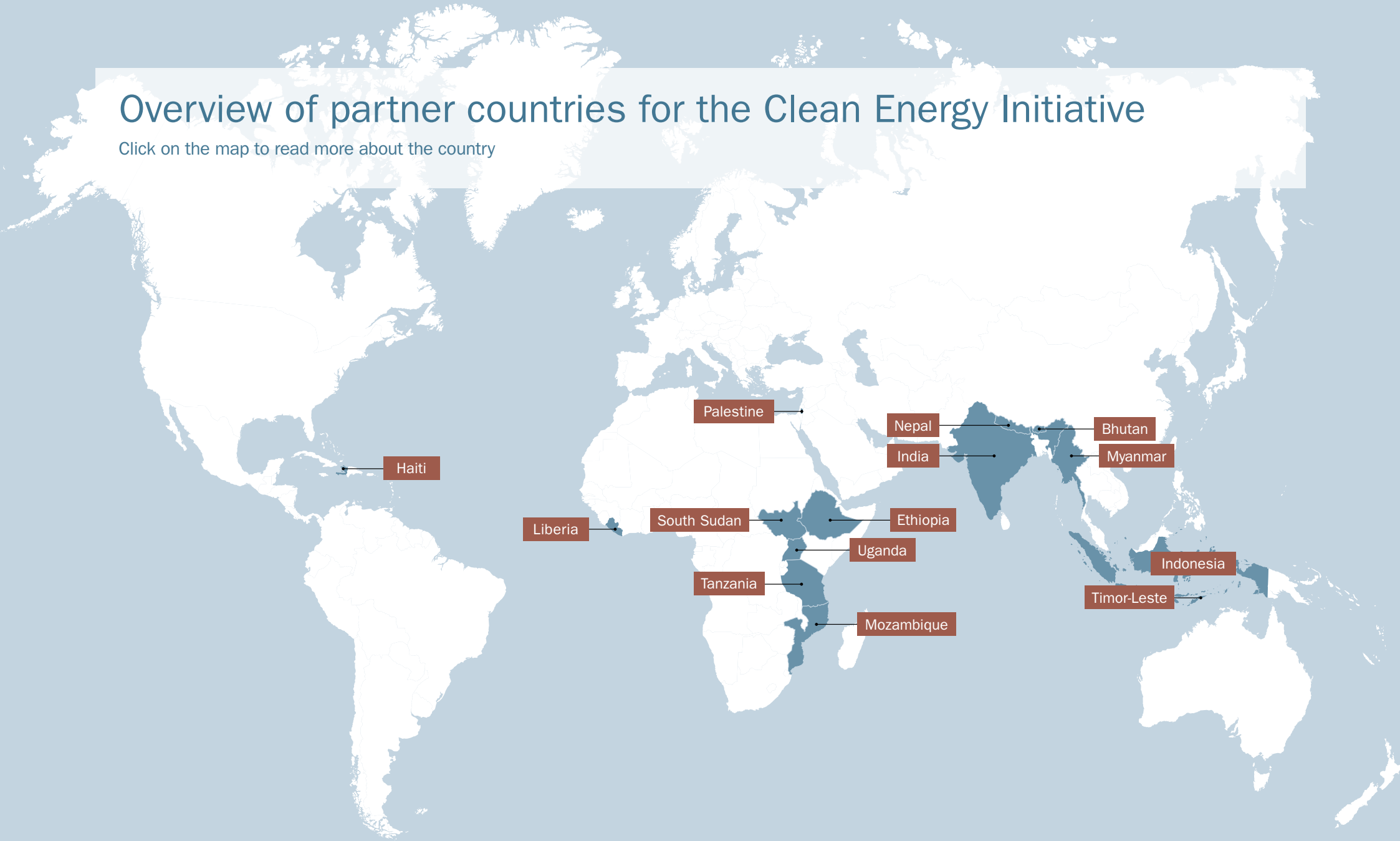
FIGURE 8 // BILATERAL GRANT FINANCING (NOK) DISBURSED BY RECIPIENT COUNTRY (EXCLUDING NORFUND)



PREVIOUS VIEW

Overview of partner countries for the Clean Energy Initiative

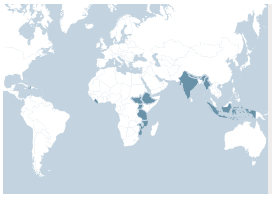
Click on the map to read more about the country



PARTNER COUNTRIES

Liberia

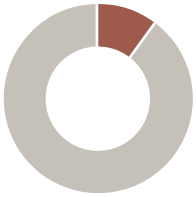
In Liberia, Norway responded to the country's urgent need to provide electricity to the population at the end of the civil war. Key areas of support include institutional and operational capacity building, urban and rural electrification and reconstruction of a hydropower plant with installed capacity of 88 MW. Norway has been a major donor, providing approximately NOK 1 000 million to the energy sector in Liberia since 2007. About half of this amount has been in support for the reconstruction of Mt Coffee hydropower station.



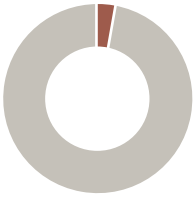
BACK TO OVERVIEW

KEY RESULTS 2007–2015

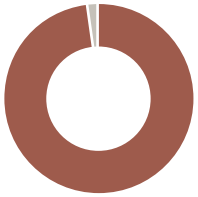
Power grid	51 kilometres 66kV transmission lines (actual)
Access	36 000 households connected to the grid (actual)
Generation	20 MW temporary diesel generators (actual) 88 MW hydropower to be commissioned in 2016 to 2017 (Mt Coffee) (expected)
Enabling framework	A modern electricity law adopted (actual) Operational hydrological network (actual)



10%
Population with electricity access



3%
Rural population with electricity access



98%
Population using biomass for cooking

SOURCE: IEA World Energy Outlook 2015

Liberia

Liberia still suffers from the aftermath of the 14-year long civil war. The war that ended in 2003 destroyed existing institutions and infrastructure. Access to quality education and human capital has been, and continues to be a colossal challenge. Whereas some economic growth from a very low level was evident, the Ebola crisis in 2014-2015 had severe economic and social impacts on the already fragile state.

Before the civil war in 1989, the Liberia Electricity Corporation (LEC) had 35 000 customers and an installed capacity of 191 MW. By 2007, the Mt. Coffee Hydropower Plant had been destroyed (1990) and LEC had 450 customers and a single row of streetlights powered by 2 MW diesel generators.

The current emergency generation capacity is based on costly diesel generators and Liberia has one of the highest electricity tariff rates in the world. Reconstruction of Mt. Coffee (88 MW) to provide cheaper and more sustainable power is thus a political priority in Liberia.

Norway has played a key role as development partner, supporting a broad portfolio of interventions, including support to grid electrification, power generation, re-building the LEC power utility and strengthening the capacity of the Ministry of Lands, Mines and Energy (MLME). Key achievements from the cooperation between 2007 and 2015 include:

- **20 MW electricity generation from temporary diesel generators.**

- **36 000 household connections to grid electricity in Monrovia** in collaboration with the World Bank and USAID through the Monrovia Grid Investment Programme. 63% of the funding is provided by Norway.

- **New Electricity Law.** A transparent legal framework is essential for the sound governance of the electricity sector and for attracting commercial investment. Norway has therefore supported the development of a new electricity law in Liberia. Liberia ratified the law at the end of 2015 after extensive stakeholder consultations. As part of this process, MLME established a legal office. Regulations pursuant to the Electricity Act are currently under development.

- **Operational hydrometric network.** Since 2013, Liberia has had an operational national hydrometric network that collects high quality hydrology data. Norway provided equipment and training for this through its national regulator NVE. Systems for collecting hydrometric data management have been established and valuable hydrological data is provided to government institutions and developers.

Liberia

- **88 MW hydropower plant (Mt. Coffee).** Reconstruction of the 88 MW Mt. Coffee hydropower plant is currently underway. When fully commissioned in 2017, the hydropower plant will transform the Liberian power sector, increasing supply and reducing pollution from power production, improving stability and potentially reducing generation costs. Norway co-finances the hydropower plant with the Government of Liberia and other development partners.

Norway is funding a management contract to compensate a shortage of qualified staff at all levels of LEC. The Canadian company Manitoba Hydro International was selected to support LEC through international tender. On-the-job training to build the capacity of permanent staff is part of the ongoing contract. In addition, Norway has supported capacity building in MLME and Liberia Hydrological Service though a twinning project with the Norwegian Water Resources and Energy Directorate (NVE).

These interventions to strengthen and build capacity have enabled the key achievements highlighted above. However, due to long-term impacts of the civil war. Liberia is an extremely difficult environment for any development intervention, in particular capacity building where lack of basic education and skills represent a key obstacle. For example, an end-review of the NVE twinning project points to a lack of progress in some areas of the programme.

A short video was created for the President's Inauguration of the first unit is available on YouTube

Read more about Mt. Coffee

Liberia

BOX 11 // RECONSTRUCTION WORK AT MT. COFFEE HPP

Although Norway, through Norfund and other instruments, works to promote private investments in developing energy sectors, there are cases where such financing is not an option. Post-conflict Liberia is one such example, where donor funding is the only way to provide clean and reliable energy services.

Norway has joined with the Government of Liberia, KfW Development Bank, European Investment Bank and (since 2015) USA's Millennium Challenge Corporation, in co-funding reconstruction of Mt. Coffee. The anticipated much lower cost of electricity from the power plant mixed with power from heavy fuel oil plants is forecast to lower the cost to consumers from USD 0.54 to a more affordable level. Reduced costs and increased reliability will benefit business as well as the population at large.

Construction is underway on the 88 MW Mt. Coffee hydro power plant. PHOTO: KNUT GAKKESTAD

PARTNER COUNTRIES

Liberia

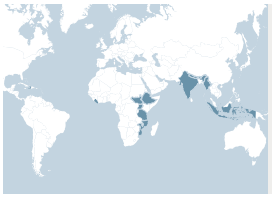
KEY PROJECTS

PROGRAMME	IMPLEMENTING PARTNER(S)	TIME PERIOD	AGREED SUPPORT
Reconstruction of Mt. Coffee hydropower plant	Government of Liberia	2012 – 2017	NOK 492 million
Monrovia Grid Investment Programme	Liberia Electricity Corporation (LEC)	2010 – 2015	NOK 249 million
Management contract for the LEC, including support to the Mt. Coffee Project Implementation Unit (PIU)	Liberia Electricity Corporation (LEC)/ Manitoba Hydro International	2012 – 2017	NOK 147 million
Monrovia Gaps project	Liberia Electricity Corporation (LEC)	2009 – 2011	NOK 82 million
Ministry of Land, Mines and Energy (MLME)-NVE institutional cooperation	MLME and the Norwegian Water Resources and Energy Directorate (NVE)	2010 – 2016	NOK 64 million
Emergency power project (diesel generators)	Jacobsen Electro and Interwood	2007 – 2010	NOK 49 million

PARTNER COUNTRIES

Uganda

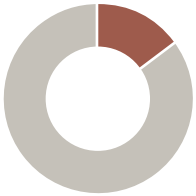
In Uganda, Norway has been a long-term partner in support of capacity building and sector reform, as well as supporting power generation, distribution and transmission line infrastructure projects. Today, Uganda is one of the most attractive environments for private power investments in East Africa. Norway has provided approximately NOK 760 million to the energy sector in Uganda since 2007, including NOK 140 million in support to the ongoing GetFit programme.



BACK TO OVERVIEW

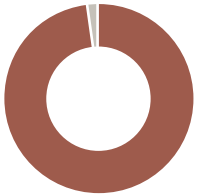
KEY RESULTS 2007–2015

Power grid	1 800 kilometres of distribution lines (actual) 525 kilometres of transmission lines (expected), of which the construction of 225 kilometres is ongoing with financial support from Norway.
Access	16 000 households, businesses, and institutions connected to the grid (actual) 9 000 households, businesses, and institutions connected to the grid (expected)
Generation	50 MW thermal generation (actual) 13 MW hydropower (80GWh/year) 183 MW hydropower leveraged through feasibility study (expected)
Enabling framework	Capacity building at key government institutions (actual) Supported 16 Ugandan master students within renewable energy at NTNU every year (actual) Increased renewable energy feed-in tariff following the GET FiT programme (actual) Standardized Power Purchase Agreement for IPPs established (actual)



15%
Population with electricity access

7%
Rural population with electricity access



98%
Population using biomass for cooking

SOURCE: IEA World Energy Outlook 2015

PREVIOUS VIEW

Uganda

Norway has cooperated closely with Uganda for 25 years, focusing on support to long-term capacity building and enabling a facilitative framework. Norway assisted in the formulation of the 1999 Electricity Act, and provided considerable technical assistance and capacity building for the establishment of an independent regulator and other institutional reforms related to the implementation of this Act.

Norway has also supported the development of electricity infrastructure including new generation capacity, transmission lines and rural electrification. Facilitating private investment in electricity generation has received more attention in recent years, not least through the GET FiT programme.

Uganda is now experiencing an unprecedented boom of new generation and transmission infrastructure construction. With a quadrupling of power generation since 2012, Uganda has a national target of 80 per cent electrification by 2040.

Key achievements from the cooperation between 2007 and 2015 include:

- **16 000 customer connections and 1 800 km distribution lines.** In co-operation with the Rural Electrification Agency (REA), Norway has supported the construction of 1 800 kilometres of distribution lines. Altogether 16 000 customers are connected to the electricity grid. An additional 9 000 customers are expected to be connected by these projects. These customers include district headquarters and other public institutions, hospitals and health clinics, schools, industrial users, small and medium businesses and households.

"Cooperation with Norway has been instrumental in setting our regulatory framework on a sure foundation"

– DR. BENON MUTAMBI, CEO OF ELECTRICITY REGULATORY AUTHORITY UGANDA

Dr. Benon Mutambi, CEO, ERA. PHOTO: GET FIT UGANDA

PARTNER COUNTRIES

Uganda

- **525 kilometres of transmission under construction.** Norway has funded feasibility studies for several high voltage transmission lines and transformer stations, including Karuma–Kampala (300 kilometres) and from Nkenda to Hoima (225 kilometres). Norway has also supported the design and construction of Nkenda – Hoima line, which with planned commissioning in 2018 will be is critical for strengthening the national grid. These new transmission lines are essential to increase electricity access, evacuate power from the planned hydropower projects in the region and facilitate the operation of potential large industry in Western Uganda.

- **13 MW of hydropower co-financed, and project preparation for 183 MW of forthcoming hydropower financed.** Norway has supported Uganda's hydropower development whilst seeking to ensure that projects adhere to environmental and social standards. Norway has funded feasibility studies for the new Isimba (183 MW) hydropower plant due to be completed around 2020. Furthermore, the government of Norway contributed about NOK 60 million (USD 12 million) in grant financing to the commercial investment by Trønder Energi and Norfund in Bugoye, a 13 MW run-of-river hydropower plant commissioned in 2009.

- **Institutional strengthening of the Transmission Systems Operator.** The Norwegian Transmission Systems Operator Statnett had a long-standing capacity building partnership with UETCL (Uganda Electricity Transmission Company Limited) from 2006 to 2014. The programme addressed systems planning, improved systems operation, grid maintenance, risk analysis and improved IT-systems and communication.

- **On-going renewable energy investments.** Norway is a co-funder of the GET FiT Program. As of June 2015, some 17 projects with a capacity of 157 MW had been approved.

For more detailed information regarding the energy cooperation between Uganda and Norway, see the report, 25 years of Energy Sector Cooperation, published by Norad in 2016.

Uganda

BOX 12 // NORWEGIAN INVESTMENTS IN SMALL HYDROPOWER

The Bugoye hydropower plant

Uganda has significant potential for small hydropower plants, particularly in the area around the Rwenzori Mountains in West Uganda and Mt. Elgon in the East.

Norwegian power producer TrønderEnergi and Norfund (the Norwegian investment fund for developing countries) developed the 13 MW hydropower project Bugoye in western Uganda commissioned in 2009 when the country was experiencing power shortage. Multiconsult (a Norwegian consultancy firm) was Owner's Engineer in partnership with engineers from the Ugandan firm Newplan.

Construction costs totalled NOK 300 million, of which Norway contributed NOK 60 million. Annual production average is 80 GWh, which amounted to seven percent of Uganda's electricity production in the year of commissioning. It provides renewable electricity to about 1.5 million people.

A study conducted by the Overseas Development Institute (ODI) in 2013 found that the construction of Bugoye helped create 10 000 new jobs in Uganda.

Bugoye Hydropower Plant PHOTO: MORTEN SVELLE

"The past three years have been the best of my career. All the power outages were ruining my business. We only had power for about 24 hours per week, while I needed to pay rent and salaries for three employees for the entire month. Since Bugoye was built however, the power supply has improved drastically."

– FRED BANANUKA,
OWNER OF A CARPENTRY WORKSHOP IN BUGOYE

Uganda

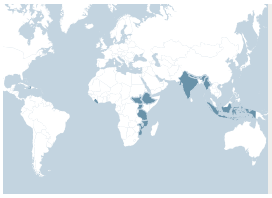
KEY PROJECTS

PROGRAMME	IMPLEMENTING PARTNER(S)	TIME PERIOD	AGREED SUPPORT
Feasibility study and implementation of Nkenda – Hoima transmission line (226 km & 220 kV)	Uganda Electricity Transmission Company Limited (UETCL)	2010 – ongoing	NOK 307 million
Rural electrification	Uganda Rural Electrification Agency (REA)	2010 – ongoing	NOK 233 million
GET FiT Uganda	KfW	2012 – ongoing	NOK 140 million
Bugoye run-of-river power plant (grant financing)	Trønder Energi and Norfund	2007 – 2009	NOK 60 million
Institutional cooperation with Uganda Electricity Transmission Company Ltd (UETCL)	Statnett	2006 – 2014	NOK 40 million
Feasibility study for Isimba hydropower plant	Ministry of Energy and Mineral Development (MEMD)	2008	NOK 21 million
Feasibility study for Karuma hydropower plant grid connection	Uganda Electricity Transmission Company Limited (UETCL)	2009	NOK 15 million
Renewable Energy Business incubator (REB)	Norges vel and Makerere University	2011 – ongoing	NOK 4 million
Procurement expert Hoima – Kafu transmission line	Uganda Electricity Transmission Company Limited (UETCL)	2011	NOK 2 million
Feasibility study Uganda – DRC transmission project	NELSAP (The Nile Equatorial Lakes Subsidiary Action Program)	2013 – 2014	NOK 14 million
Feasibility study Mirama Hill – Nsongezi transmission line	Uganda Electricity Transmission Company Limited (UETCL)	2013	NOK 9 million
Feasibility study Hoima – Kafu	Uganda Electricity Transmission Company Limited (UETCL)	2012	NOK 7 million
Investment grant for Namahue Thermal Plant	Jacobsen Elektro	2007	NOK 71 million

PARTNER COUNTRIES

Tanzania

In Tanzania, Norway has provided support to connect the island of Pemba (population 360 000) to the national grid, provided clean cooking stoves to more than 50 000 households, and grid-connected 10 500 households on Zanzibar. An emergency repair project for TANESCO's major hydropower plants increased electricity production and reduced losses worth USD 15-20 million per year. Norway provided NOK 680 million in grant financing to the energy sector in the 2007-15 period.

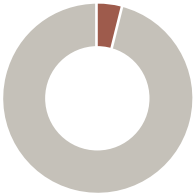


BACK TO OVERVIEW

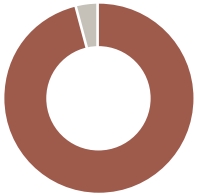
KEY RESULTS 2007–2015

Power grid	175 km transmission lines (incl. subsea cable) (actual) 165 km distribution lines (actual) 1 000 km of distribution networks (low voltage) (expected)
Access	10 500 grid connections to the grid (actual) 1 500 isolated solar systems (actual) 50 000 households provided clean cooking technologies (actual) 55 000 new electricity customers through support to Rural Energy Agency (expected) Grid connection for 4 000 small-medium businesses nationwide (expected)
Generation	16 MW rehabilitated capacity of existing hydropower plants 25 MW diesel generators Government initiative to promote productive end use of electricity (ongoing) Established framework for cost-efficient results-based financing of rural electrification
Enabling framework	Capacity building at key government institutions (actual) Grid Development Plan developed (actual)

24%
Population with electricity access



4%
Rural population with electricity access



96%
Population using biomass for cooking

SOURCE: IEA World Energy Outlook 2015

PARTNER COUNTRIES

Tanzania

Since 2007, increased access and improved power supply reliability have been key factors in Tanzania's strides towards becoming a middle-income country. However, further increasing access to affordable modern energy services is critical for rural Tanzania to transform into a modern economy and improve rural Tanzanian livelihoods.

The energy sector has been a key area of cooperation between Norway and mainland Tanzania and Zanzibar. Like Norway, Tanzania has a large share of hydropower in its energy mix. At the request of Tanzania, Norway has contributed expertise to the development of several of the existing hydropower plants in the country. Norway has also supported capacity building through cooperation between Tanzania's national utility TANESCO and Statnett, Norway's Transmission System Operator and the Norwegian Water Resources and Energy Directorate (NVE)

The current portfolio of supported energy programmes and projects promotes Tanzania's goals to increase energy access and continue capacity building programmes with TANESCO and ZECO (the power utility on Zanzibar), as well as the regulatory authority, EWURA.

Key achievements from the cooperation between 2007 and 2015 include:

- **Connecting a population of 360 000 (Pemba) to the national grid.** The 73 kilometre subsea cable, financed partially with the support of a NOK 300 million grant from Norway, connected the island of Pemba to the Tanzania mainland. The cable supplements previous support to grid electrification on Zanzibar, and provides 80 per cent of the villages on Pemba with electricity from the mainland.

An impact assessment carried out in 2016 of the support to electrification on Pemba[4] reported, amongst other things, that the number of business establishments increased by 70 per cent in the four years following the cable's commission. During the same period, the number of employees increased by 149 per cent. The number of tourist arrivals in 2013 was almost double that of 2010 with positive ripple effects for job creation in the tourism and leisure industry. The impact assessment found, however, no substantial evidence that the interventions have had any effect on incomes and poverty reduction, and that a large part of the development benefit remains untapped because of weak governance or inadequate accompanying measures to ensure higher connection rates and productive use of energy.

4 ILPI 2015, Impact assessment of Norwegian support to the energy and road sectors in Pemba, Zanzibar, International Law and Policy Institute, Report 03/2015.

PARTNER COUNTRIES

Tanzania

- **Grid connected 10 500 households, businesses, schools, and clinics on Zanzibar.** The Zanzibar rural electrification phase IV extension project provided electricity to 63 villages, totalling approximately 10 500 households. The provided infrastructure includes 90 kilometres of high voltage network, 165 kilometres of low voltage network, and 66 transformers. Reported benefits include schools being able to continue teaching after dark and to organize evening classes prior to exams. Electricity access has also opened up the possibility of offering night classes for illiterate adults. Reliable electricity seems to have contributed to higher school enrolment and attendance. Within the agricultural sector, reliable electricity has enabled farmers to utilize fridges and freezers to minimize food waste. Electricity has therefore increased farmers' income. New types of businesses have also developed, such as sales of fresh drinks and ice cream.
- **Improved livelihoods for more than 50 000 households through access to clean cooking technologies.** Norway has supported the Tanzanian non-governmental organization TaTEDO's work on clean cookstoves. The organization reports that it has provided improved firewood stoves for 43 818 rural households and improved charcoal stoves for 6 581 urban households. The project's beneficiaries have cut their charcoal consumption by 50 per cent, while wood stoves have reduced fuel consumption between 40 and 75 per cent. In addition to improving energy efficiency, reducing deforestation, and saving lives through reduced indoor air pollution, the project has also generated 844 new enterprises that produce and distribute stoves.
- **Hydropower plant rehabilitation improved energy security, and gave energy savings of USD 15-20 million per year.** In 2011, Norway and Tanzania signed an agreement for the Emergency Repair Project under which NVE supports the Tanzanian utility TANESCO in repair works required to ensure continued and stable operation of their five largest hydropower plants. The project includes equipment purchase for emergency repair work and on-the-job training of personnel in all areas of operation and maintenance. Results include a reduction of 93 per cent in power outages at New Pangani Falls (68 MW), a reduction of 25 per cent in internal power consumption at Lower Kihansi (180MW) through the purchase of a new chiller, and thirdly restoration of turbine output from 67 to 100 per cent at Kidatu (204 MW). Combined energy savings from the project are estimated at USD 15–20 million annually.[5]

5 Rough assessment based on 0,12 USD/kWh and plant factor 50%.

Tanzania

- **A twinning project with Statnett contributed to improved management of the national grid,** and improved utilization of grid capacities. A 2012 mid-term review of the project found that TANESCO had increased its transmission system planning capacity and was less dependent on external consultants. The review also found improved technical power system information usage for both operations and long term planning. The project contributed to the development of the first Grid Development Plan and improved capacity for planning and management of large investment projects. An Asset Register that was developed also improved transmission grid maintenance operation and planning.

- **Rural Energy Fund.** The programme includes financial support to the Rural Energy Fund as well as an institutional reform programme for the Rural Energy Agency (REA), which was set up in 2006 to manage the fund. The Rural Energy Fund gets funding from several different sources, including the petroleum import levy and international development partners. The fund aims to increase access to modern energy in rural areas, including through grid extension, private investment in isolated grids as well as solar home systems, efficient stoves and other distributed solutions. Three proposed investment projects within electrification and biogas are currently underway, and are expected to provide grid connection for 55 000 households and 4 000 small businesses, biogas systems for 10 000 households in rural Tanzania. Norway has also supported the development of an investment plan for rural electrification (Prospectus).

Work on the 73-kilometre subsea cable connecting the island of Pemba on Zanzibar to the Tanzanian main grid. PHOTO: MULTICONSULT

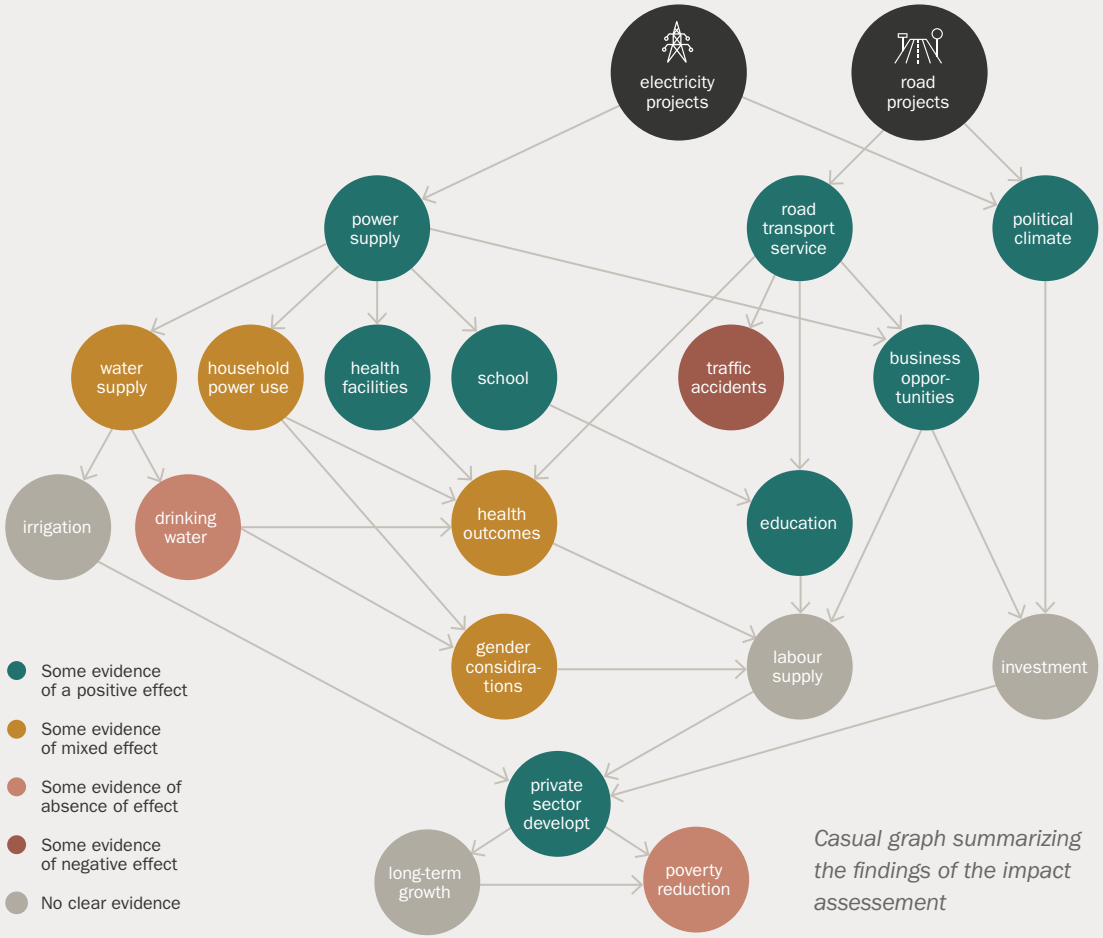
BOX 13

The complexity of impacts

From 2004 to 2012, Norway contributed considerable funds towards a submarine cable to the island of Pemba on Zanzibar, and electrification of a number of villages. The support also comprised rehabilitation of several roads on the island. A 2015 Impact Assessment of the interventions presented a theory of change for the interventions, and used this to analyze their impacts. The figure summarizes the findings, and demonstrates how many links and external factors exist between the projects in relation to their success or failure in providing change.

"The economic consequences of the cable, for instance, are naturally larger in villages that are electrified and have access to good roads."

– ILPI TEAM



Casual graph summarizing the findings of the impact assessement

PARTNER COUNTRIES

Tanzania

KEY PROJECTS

PROGRAMME	IMPLEMENTING PARTNER(S)	TIME PERIOD	AGREED SUPPORT
Rural Energy Fund (REF)	Rural Energy Agency (REA)	2013 – ongoing	NOK 700 million
Pemba–Tanga subsea cable	Zanzibar Ministry of Water, Construction, Energy and Land	2009 – 2010	NOK 300 million
Emergency repair project	TANESCO and NVE	2009 – ongoing	NOK 67.5 million
Zanzibar rural electrification phase IV extension project	Zanzibar electricity cooperation (ZECO)	2006 – 2009	NOK 45 million
Twinning TANESCO and Statnett	TANESCO and Statnett	2010 – 2014	NOK 37 million
Development of modern cooking technologies	TaTEDO	2007 – 2010	NOK 11 million

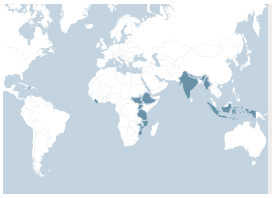
PARTNER COUNTRIES

Mozambique

In Mozambique, Norway has been a key partner in the Government's push to increase electrification rates. Since 2007, based on requests from Mozambique, Norway has primarily supported grid extensions. Key achievements include more than 40 000 new connections. Norway has provided approximately NOK 640 million in grant financing between 2007 and 2015.

KEY RESULTS 2007–2015

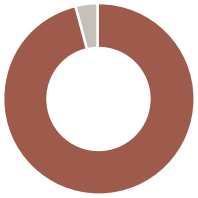
Power grid	467 km transmission lines (actual) 985 km distribution lines (actual)
Access	40 500 gridconnections (actual)
Generation	295 MW gas (transaction advice) (actual) 40 MW gas (transaction advice) (expected)
Enabling framework	Build the national utility's business development capacity, facilitating an expected fivefold increase in revenue over the next five years (expected) Support to implement gender mainstreaming activities in the energy sector



BACK TO OVERVIEW

39%
Population with electricity access

27%
Rural population with electricity access



96%
Population using biomass for cooking

SOURCE: IEA World Energy Outlook 2015

PARTNER COUNTRIES

Mozambique

Mozambique's energy sector has developed rapidly from the mid-2000s. In 2007, 11 per cent of the population had national grid connection. By 2015, the share with grid connection had more than doubled to 26 per cent. During the same period, the number of district capitals connected to the grid had increased from 64 to 135, meaning that today, 96 per cent of the country's districts are grid-connected.

Given the Mozambique government's emphasis on national grid expansion and the need to bring affordable electricity from the 2 000 MW Cahora Bassa hydropower plant to the rest of the country, support to transmission and distribution lines has been at the heart of Norway's support.

Key achievements from the cooperation between 2007 and 2015 are:

- **More than 37 000 connections in Niassa and Zambezia.** A 2013 Impact Assessment of the Norwegian funded Gurué-Cuamba-Lichinga Transmission Line and Namacurra Electrification projects resulted in 37 000 new households, institutions, and businesses gaining access to grid electricity, far above the 10 000 that were expected. It is expected that the number of connections has increased substantially further since 2013. Low connection fees were a contributing factor to this success. Supplementary financing from Sweden has also contributed to these results. The impact assessment also highlighted that tangible results of electrification efforts often take many years to materialize. A high proportion of low-income households were connected, and the communities reported substantial benefits from electrification such as improved security, health, and education as well as probable improvements in business profits and productivity. Electrification has resulted in a transformation in household lighting and appliance use, but has virtually no effect on cooking, with 100% of electrified households surveyed still using charcoal or wood.

  Regarding incomes, there is evidence that electrification of existing businesses has probably improved profits and productivity, increasing the general income level in the region. However, this is moderated by the limited impact on generation of new productive activities.

- **3700 household connections and improved electricity supply to Cabo Delgado.** Norway has supported Mozambique's efforts to provide access to energy in the northern province of Cabo Delgado through the Rural Electrification of Cabo Delgado programme. To date, the project has resulted in 3 700 household connections to the grid, along with eight schools, 15 health clinics and 45 businesses. The programme has also contributed to increased grid stability.

Mozambique

- **Building of the business development capacity of the national utility (EDM)**. In addition to infrastructure investments, Norway has also supported the institutional strengthening of EDM and the Ministry of Energy. One programme has focused on business development within EDM. The programme has helped prepare major contracts with private developers, as well as develop standardized agreements. Specifically, the programme has contributed to agreements for three gas power plants for 335 MW, with a total value of USD 600 million. 295 MW of this capacity is already commissioned. Because of the power plants, EDM's export incomes are expected to increase more than fivefold over the next two years.

Norwegian funded trafo station in Cabo Delgado region PHOTO: ENDRE OTTOSEN

RURAL ELECTRIFICATION DILEMMA

The 2013 Impact Assessment points to the positive socio-economic benefits of Gurué-Cuamba-Lichinga Transmission Line and Namacurra Electrification projects, but also to the negative financial impact of the national utility Electricidade de Moçambique (EdM), and thereby the longer term sustainability of the projects. The combination of high network expansion costs, high losses and low sales revenues in rural electrification projects is of concern in many developing countries, as this limits the respective utilities' ability to expand and maintain the grid in a proper manner.

BOX 13 // DIRECT INVESTMENTS IN INFRASTRUCTURE

One in a million – powering a female entrepreneur in Mocubela

Mrs. Balbina Fimiosse Massingue (43) (far right) is an industry owner in Maganja da Costa town of Mucabela, which was connected to the national grid as a result of the Namacurra electrification project. Decades ago, she earned her living selling nuts at the local market. Today she employs over 25 full time workers at her timber concession and newly established sawmill.

Like most other entrepreneurs in the area, she has had no access to credit. Using her own savings she has worked her way up, first buying timber concessions from the government, then selling timber to the local saw-mills. She has invested around MTZ 850 000 (over USD 28 000) in two industrial size saws and expanded her fleet of timber trucks to four.

Mrs. Massingue connected her house and sawmill to the grid only 20 days before a Norad Impact Assessment team visited in 2013. At that time she did not yet know how large her electricity bill would be. With raw-material (timber) costs of MTZ 1 600/m3, and a sales price for plank in Maputo between MTZ 9 000/m3 and 15 000/m3 she is, however, sure that bringing the goods directly to the market in Maputo, rather than selling unprocessed timber locally makes good business sense.

Mrs. Balbina Fimiosse Massingue with her staff at the sawmill. PHOTO: INGAR FLATLANDSMO

Mozambique

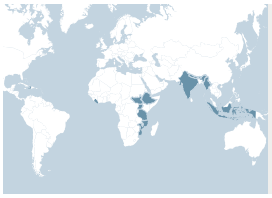
KEY PROJECTS

PROGRAMME	IMPLEMENTING PARTNER(S)	TIME PERIOD	AGREED SUPPORT
Rural electrification in Cabo Delgado	EdM	2007 – 2015	NOK 349 million
Gurué- Cuamba-Lichinga Transmission Line Project	EdM	1999 – 2009	NOK 316 million
Namacurra Electrification Project	EdM	2002 – 2006 (results largely materialized after 2007)	NOK 56.4 million

PARTNER COUNTRIES

Nepal

In Nepal, Norwegian support has targeted off-grid renewable energy capacity, in addition to on- and off-grid transmission and distribution infrastructure. In addition, Nepalese and Norwegian universities and research institutions have cooperated extensively on energy research. Between 2007 and 2015, Norway provided approximately NOK 520 million in grant funding to the energy sector in Nepal.



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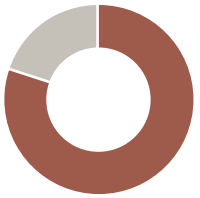
KEY RESULTS 2007–2015

Power grid	66 kilometer transmission lines (actual) 350 kilometer distribution lines (actual) 280 kilometer transmission lines (expected) 50 kilometer distribution lines (expected)
Access	11 700 grid connections (actual) 180 000 off-grid connections (actual) 645 000 distributed solar household systems (actual) 1 042 000 hh clean cooking technologies (actual) 9 000 grid connections (expected)
Generation	1 MW hydropower (actual) 456 MW hydropower leveraged through feasibility study (expected)
Enabling framework	Capacity building at key government institutions (actual) Enhanced capacity to undertake hydraulic modelling and sediment handling (actual)

76%
Population with electricity access

72%
Rural population with electricity access



80%
Population using biomass for cooking

SOURCE: IEA World Energy Outlook 2015

PARTNER COUNTRIES

Nepal

It is estimated that the economically feasible hydropower potential in Nepal is 40 000 MW. So far, less than 1000 MW of hydropower has been developed, and the country routinely faces extensive load shedding. However, there is now a significant pipeline of hydropower projects at various stages of development.

Norway's involvement in Nepal's energy sector goes back to 1965 when Butwal Technical Institute was founded with assistance from the Norwegian Himalayan Mission (Himalpartner). Norway has also provided support to establish the School of Engineering at Kathmandu University (KU) and hydropower-relevant laboratory infrastructure. In recent years, responding to requests from the Government of Nepal, most of the energy assistance has been allocated to off-grid renewable energy and transmission and distribution projects.

Key achievements from the cooperation between 2007 and 2015 include:

- **More than 6 million beneficiaries of the off-grid renewable energy programme.** The Energy Sector Assistance Programme and later the National Rural Renewable Energy Programme have resulted in about 180 000 households gaining access to electricity through mini-grids (hydro) and 645 000 gaining access to electricity through stand-alone systems (solar). In addition, 1 042 000 households now have access to improved cooking solutions (cookstoves and biogas). In total, more than 6 million people have benefited from the programmes, which have been supported by Norway and other donors. As well as increasing access to electricity, the programmes contribute to reducing indoor air pollution and pressure on forest resources. The National Rural Renewable Energy Programme also has an income-generating component with special focus on reaching women and disadvantaged groups. Norway has contributed approximately 25% of the total program financing.

- **11 700 households gained access to grid electricity.** Adjacent to the Khimti, Andhi Khola and Jhimruk hydropower plants, 11 700 households were grid-connected with the help of Norwegian funding between 2007 and 2015. The project partners were the private companies Himal Power Limited and Butwal Power Company. These projects also included productive use components.

- **Hydropower research capacity built.** Norway has supported three research projects to strengthen Nepal's national research capacity for hydropower and other renewable energy sources. Support to the hydraulic laboratory (Hydro Lab) has resulted in in-country competency in hydraulic modelling and sediment handling.

Nepal

Several hydropower projects have purchased consulting services from HydroLab in recent years with international financing. The cooperation with Kathmandu University has resulted in establishing a turbine testing laboratory and increased interaction between academic staff and the industry. Finally, the Norwegian University of Science and Technology, Sintef Energy Research, Himalpartner and the International Centre for Hydropower have a longstanding cooperation with HydroLab and Kathmandu University. The number of BsSs, MsSc and PhD students who graduated from the School of Engineering at KU between 2007 and 2015 amounted to 1 230 (165 women) 114 (12 women) and 4 (no women), respectively.

- **Funded project preparation for 456 MW of hydropower currently under construction.** In 2003, Norway funded a feasibility study for a 456 MW hydropower plant project entitled Upper Tamakoshi. Between 2007 and 2015 the project reached financial close and construction works are ongoing. It is expected to be commissioned in 2018. Norway also supported the development of six feasibility studies (with a total capacity of 155 MW) through cooperation with the Department of Electricity Development (DoED). Nepali consulting companies undertook the studies with technical assistance from the Norwegian Water Resources and Energy Directorate (NVE), contributing to capacity building. None of these projects have so far been developed, but some are being considered by national developers.

Upper Tamakoshi PHOTO: JAN ERIKSEN

- **9 000 households are expected to gain access through support to transmission and distribution lines.** A transmission and distribution project co-financed with the Asian Development Bank will result in the construction/rehabilitation of about 280 kilometres of transmission lines and 50 kilometres of distribution lines, electrification of 9 000 households and rehabilitation of 1.1 MW of hydropower. Construction works are ongoing.

Nepal

USING HYDRO LAB TO CARRY OUT STUDIES FOR THE BASIS OF INVESTMENTS IN HYDROPOWER PROJECTS

Extract from a news article, 17 March 2016 on Hydro Lab

Hydro Lab successfully completed the hydraulic test of a 1200 MW Budhigandaki reservoir hydropower project. The current Deputy Prime Minister and Energy Minister were present during the hydraulic test demonstration by Hydro Lab. The first hydraulic test showed that the design would lead to high siltation and therefore the design model was changed before carrying out the second hydraulic test, which was successful.

KEY PROJECTS

PROGRAMME	IMPLEMENTING PARTNER(S)	TIME PERIOD	AGREED SUPPORT
Energy Sector Assistance Programme (ESAP) and National Rural Renewable Energy Programme (off-grid)	Alternative Energy Promotion Centre (AEPC)	2007 – 2017	NOK 395 million
Nepal Electricity Transmission Expansion and Supply Improvement Project	Asia Development Bank (ADB) and Government of Nepal	2012 – 2017	NOK 150 million
South Asia Sub-Regional Economic Power System Expansion Project (SASEC)	Asia Development Bank (ADB) and Government of Nepal	2014 – 2021	NOK 180 million
On-grid electrification with Himal Power Ltd and Butwal Power Company	Himal Power Ltd and Butwal Power Company	2007 – 2013	NOK 33 million
Research cooperation	HydroLab and Kathmandu University	2007 – 2015	NOK 24 million
Feasibility studies	Nepal Electricity Authority (NEA) and Department of Electricity Development (DoED)	2003 – 2015	NOK 23 million

PARTNER COUNTRIES

Ethiopia

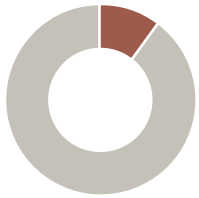
In Ethiopia, Norway has provided technical assistance for hydropower development and piloted results-based support for the country's clean cookstoves programme. Norway has provided approximately NOK 160 million in grant support since 2010 when support to the energy sector began.

KEY RESULTS 2007–2015

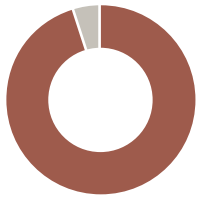
Enabling framework

Pre-feasibility study for 1 940 MW of hydropower financed (actual)
Off-grid electrification plan prepared (actual)

24%
Population with electricity access

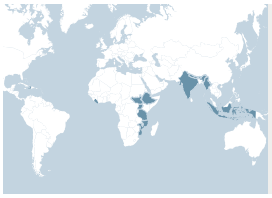


10%
Rural population with electricity access



95%
Population using biomass for cooking

SOURCE: IEA World Energy Outlook 2015



BACK TO OVERVIEW

PARTNER COUNTRIES

Ethiopia

In 2011, Ethiopia, the UK and Norway entered into a climate partnership with renewable energy as one of its pillars. Subsequently, Norway and Ethiopia entered into an Energy+ partnership with the objective to increase access to renewable energy and reduce emissions of greenhouse gases in rural areas. The first phase of this cooperation focused on creating the enabling environment and necessary institutional capacity to enter into results-based support.

Norway has also supported an institutional support programme between the Ministry of Water and Energy (later Ministry of Water, Irrigation and Electricity) and NVE. The programme commenced in 2010 based upon a request by the Government of Ethiopia for Norwegian support for two feasibility studies at the Abay River. NVE was a technical advisor to the Ministry concerning project management, quality assurance and implementation of a hydrological campaign.

Key results include:

- **Pre-feasibility for possible 3 440 MW hydropower.** Prepared pre-feasibility studies for the Mandaya (1 500 MW) and Beko Abo (1 940 MW) Multipurpose Projects. Due to the decision by the Ethiopian government to build the 6000 MW Grand Renaissance Dam on the Blue Nile at the border with Sudan and issues related to the future cooperation between Nile riparian countries, it was decided to terminate the work on preparing feasibility studies in 2014. As a result, the institutional support programme was also terminated. The Grand Renaissance Dam will submerge the Mandaya dam.[6]

- **Supported implementation of the national cook stoves programmes** by establishing National quality standards (for cook stoves, solar PV, biofuel) and testing laboratories. According to reports, the national programme has sold a total of 8.1 million cook stoves since 2013 with significant reductions in emissions of greenhouse gases (in the order of 3 million tCO2e).

- **Off-grid investment plan prepared.** Energy+ funding supported the formulation of an off-grid electrification plan completed in 2015.

- **Conversion of diesel pumps to renewable energy:** Prepared plans for conversion of 600 diesel-powered water pumping stations to renewable energy (wind and solar) and commenced work on 60 sites.

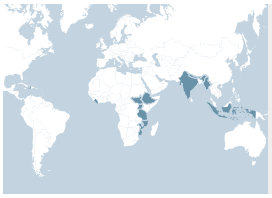
- **Energy Sector Gender Action Plan.** In 2014, Norway supported the development of a gender action plan for the energy sector.

6 Therefore not included in the figure in the box presenting key results above.

PARTNER COUNTRIES

Palestine

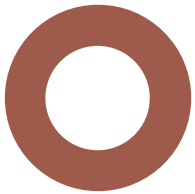
In Palestine, Norway has supported energy sector development since the Oslo Accord was signed in 1993. Since 2007, support has aimed to improve the financial sustainability of the power sector through i) increasing the number of connections by 57 per cent, ii) improving collection rates to 85 per cent through distribution of 229 000 prepaid meters, and iii) supporting infrastructure improvements to reduce technical losses. Norway provided approximately NOK 135 million in grant financing to energy sector development in Palestine between 2008 and 2015.



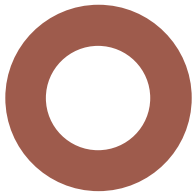
BACK TO OVERVIEW

KEY RESULTS 2007–2015

Access	218 000 household connected to the grid (actual) 229 000 prepay meters installed (actual)
Enabling framework	New electricity distribution company established (actual) Electricity law passed



100%
Population with electricity access



100%
Rural population with electricity access

0%
Population using biomass for cooking

SOURCE: IEA World Energy Outlook 2015

PARTNER COUNTRIES

Palestine

Norway has supported a programme aimed at reducing the fiscal burden of the electricity sector on the Palestinian Authority's budgetary resources and strengthening the electricity grid. Key achievements from the cooperation between 2007 and 2015 include:

- 218 000 new household connections facilitated through network rehabilitation and further extension of the grid to more than 50 villages and communities in the Hebron region.
- 229 000 prepaid meters installed, contributing to collection rates of 85 per cent in 2015.
- Northern Electricity Distribution Company (NEDCO) established, which is responsible for servicing Nablus, Jenin, and 33 other neighbouring villages.

Solar power plant in Jericho, Palestine. PHOTO: HARALD BIRKELAND

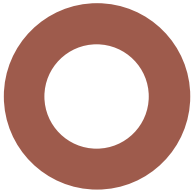
PARTNER COUNTRIES

Bhutan

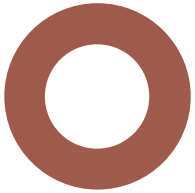
In Bhutan, Norway has supported capacity building in the energy sector, and the preparation and implementation of a modern regulatory framework. Norway has provided approximately NOK 100 million in grant financing between 2007 and 2015.

KEY RESULTS 2007–2015

Generation	Supported feasibility study for 720 MW of hydropower now under construction (expected)
Enabling framework	National hydrological network established. (actual) Power sector regulator established and empowered. (actual) State-owned power company enabled to develop hydropower projects. (actual) Strengthened investment framework within energy efficiency and renewable energy (expected)



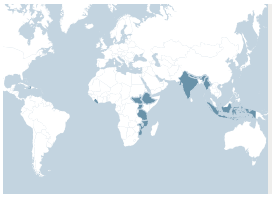
100%
Population with electricity access



100%
Rural population with electricity access

0%
Population using biomass for cooking

SOURCE: Royal Norwegian Embassy



BACK TO OVERVIEW

Bhutan

Between 2007 and 2015, the South Asian Kingdom of Bhutan made a remarkable leap from 48 per cent electrification to 100 per cent, bringing electricity to an estimated 350 000 households. Restructuring and strengthening energy instituitions has been a pre-requisite for this progress.

Development cooperation with Bhutan dates back to 1989, when a Power System Master Plan was prepared by UNDP with Norwegian funding. Since 1999, Norway has focused on providing support through NVE for institutional strengthening and human capacity building with a total budget of NOK 60 million.

In 2013, Norway and the Asian Development Bank entered into a five-year Energy+ partnership with Bhutan, aiming to support efforts to increase access to sustainable energy and reduce greenhouse gas emissions through the use and development of renewable energy and energy efficiency.

A total of NOK 35 million was allocated to the first phase of the cooperation, scheduled to be completed in 2016. Because of a reduced budget, it was decided to phase out all energy-related development cooperation with Bhutan in 2016.

Learning by doing

"Job engagement, both in Bhutan and Norway, proved to be very valuable and successful. The Bhutanese participants learned by seeing and doing: From practising with close supervision from experts in hydrology and hydropower potential estimation, to forecasting and determining sustainable hydropower-based electricity tariff."

"The Bhutanese learned about sustainable ways of developing hydropower resources, electricity tariff pricing and regulation to make it affordable, and to get the economy started. The programme was appropriate for the prevailing situation and the development stage of Bhutan at that time. We learned a lot from the rich experience and expertise of senior hydropower professionals from Norway, both in theory as well as in practice."

– BHARAT TAMANG YONZEN, A MEMBER OF THE PRIVY COUNCIL OF BHUTAN, FORMER ENERGY SPECIALIST IN BHUTAN'S MINISTRY OF ECONOMIC AFFAIRS AND MANAGING DIRECTOR OF BHUTAN POWER CORPORATION (BPC) LTD

PARTNER COUNTRIES

Bhutan

Key achievements from the cooperation between 2007 and 2015 include:

- **The establishment of an independent regulator.** Through NVE, Norway has supported the establishment and capacity building of the Bhutan Electricity Authority, which, among other tasks, sets energy tariffs, develops regulatory frameworks and oversees licensing.

- **Establishment of a hydrological network.** Through NVE, Norway has supported a broad range of activities aimed at facilitating hydropower development. Examples include support to develop a hydrological database and training for staff at the Department of Meteorology and Hydrology. Reliable hydrological data is a prerequisite for successful and sustainable hydropower development.

- **Facilitated unlocking the 720 MW Mangde Chhu hydropower project.** The design of the project was studied with support from Norway. It is now under construction by an Indo-Bhutanese joint venture, and expected to be commissioned in 2017. Electricity sales to India from Mangde Chhu will generate income for Bhutan.

- **Pre-feasibility study of 73 MW hydropower project (Jhomori).** Through the NVE cooperation and capacity building through on-the-job training enabled staff at the Department of Hydropower Systems to carry out a pre-feasibility study of the Jhomori HPP project (73 MW).

- **Institutional strengthening of the state-owned power company.** Through NVE, Norway has supported the evolution of the state-owned power company, Druk Green Power Corporation, into a fully staffed and professional organization with its own planning, design, environmental and business development units.

- **Endorsed reports on two pre-feasibility studies of hydropower projects, renewable energy master plan and national energy efficiency policy through the Energy+ Initiative.** From 2014 to 2016, NOK 36.5 million was allocated to the readiness phase of the Energy+ programme. This resulted in the Bhutanese government endorsing reports on two pre-feasibility studies of hydropower projects, renewable energy master plan and national energy efficiency policy.

PARTNER COUNTRIES

Myanmar

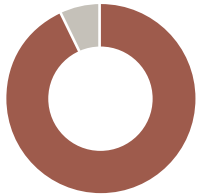
In Myanmar, Norway has supported efforts to advance regulations and capacity to provide a sustainable hydropower development framework, including a modern Electricity Law. Myanmar is a new core partner country, and Norway has provided approximately NOK 55 million in support since 2012.

KEY RESULTS 2007–2015

Generation	119 MW natural gas under development (actual)
Enabling framework	New Electricity Law adopted (actual) Innovative small-scale renewable models developed (actual)

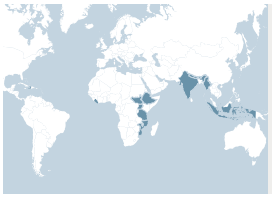
32%
Population with electricity access

18%
Rural population with electricity access



93%
Population using biomass for cooking

SOURCE: IEA World Energy Outlook 2015



BACK TO OVERVIEW

PARTNER COUNTRIES

Myanmar

Myanmar's energy sector faces many challenges and opportunities as the country transitions towards democracy. The country relies on traditional biomass for 75 per cent of its energy needs. Grid-connected power supply is intermittent due to the seasonality of hydropower production, and insufficient transmission and distribution capacity.

The cornerstone of the energy cooperation between Myanmar and Norway is a five-year institutional cooperation between NVE and the Ministry of Electricity and Energy (MOEE). A technical standard for hydropower construction has been developed and an environmental standard is being finalized. An environmental and social working group focusing on hydropower development has been appointed, and capacity building for utility employees has been provided through the International Centre for Hydropower.

Key achievements from the cooperation between 2007 and 2015 include:

- **Improved efficiency of a 119 MW gas power plant.** Norway provided support to develop a feasibility study and assist during the procurement process for the upgrading of the Thaton gas power plant. The Norwegian contribution unlocked a USD 150 million investment that will make the power plant 2.5 times more efficient.

- **Establishment of a modern legal energy framework.** A revised Electricity Law was approved in 2014.

- **Strengthening of the hydrological network.** Hydrological data and network mapping forms the basis for improving the hydrological database. The first online hydrological gauging station was operational in late 2015.

- **Development of innovative small-scale renewable models.** Norway supported a local company developing innovations within small-scale renewable energy. Products such as a solar-based irrigation pump save farmers an average of 42 hours of work per month. In addition the products significantly increased incomes – on average by USD 254 per year.

Dam site, Upper Keng Tawng Hydropower project PHOTO: FRIDA MARTINSSON (MULTICONSULT)

PARTNER COUNTRIES

Myanmar

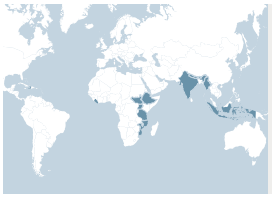
KEY PROJECTS

PROGRAMME	IMPLEMENTING PARTNER(S)	TIME PERIOD	AGREED SUPPORT
Institutional cooperation between NVE and MOEE	NVE and MOEE	2014 – 2018	NOK 87 million
Support to combined cycle gas turbine (CCGT) power plant	Norconsult	2014 – 2015	NOK 5 million
The establishment of a new Electricity Law	Asia Development Bank	2012 – 2013	NOK 5 million
Developed innovative small-scale renewable model	Proximity Design	2014 – 2016	NOK 8 million

PARTNER COUNTRIES

Haiti

In Haiti, support to the energy sector has been an important element of Norway's contribution to long-term reconstruction after the devastating earthquake of 2010. Norway has supported a broad range of energy access initiatives, including provision of clean energy services to 11 500 households, and construction of 27 kilometres of mini-grid distribution lines. Norway has provided approximately NOK 50 million in grant financing between 2011 and 2015.

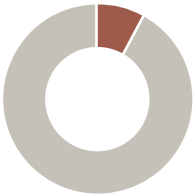


BACK TO OVERVIEW

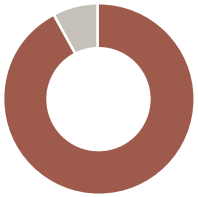
KEY RESULTS 2007–2015

Power grid	27 km mini-grid distribution lines (actual)
Access	700 households connected to mini-grids (actual) Off-grid lighting services to 10 800 households (actual) Solar-powered streetlight for 15 000 people (actual)
Generation	140 kW of solar PV installed to hybridize 400kW of diesel generators (actual) Feasibility assessment of multiple potential on-grid renewable energy projects (actual)
Enabling framework	Establishment of a national solar training centre (actual)

29%
Population with electricity access



8%
Rural population with electricity access



92%
Population using biomass for cooking

SOURCE: IEA World Energy Outlook 2015

PARTNER COUNTRIES

Haiti

On 12 January 2010, a devastating earthquake struck Haiti, leading to more than 200 000 deaths, including 17 000 state employees. Approximately 1.5 million people were internally displaced. The economic losses were estimated to be around USD 7.8 billion, more than Haiti's gross national product. Norway's response has been to provide extensive humanitarian aid and long-term development assistance.

Energy access levels in Haiti are extremely low. The country has no national power grid, only a few regional grids managed by Energie d'Haïti and a number of diesel-powered mini-grids. The regional grids are unreliable, poorly managed, and generally only cover major town centres. Energy governance is weak, with no energy ministry, regulator or current national policy.

Norwegian assistance to the energy sector has been integrated into a larger strategy for promoting decentralized sustainable development via longer term projects in agriculture, forestry, fisheries, protected area management, decentralized governance, disaster risk reduction, energy, sanitation and education. Norway has contributed towards realizing a range of sustainable energy activities through the United Nations Environment Programme (UNEP). UNEP has in turn collaborated with the Government of Haiti and a wide range of specialist organizations. Given the difficult situation of the national grid and the weakness of the state, the focus of the investment has been on off-grid, providing basic energy access services to the rural poor.

Key achievements from the cooperation between 2007 and 2015 include:

- **10 000 solar lanterns and home systems sold via a supported social enterprise**
  The Norwegian assistance has been channelled through the program managed by UNEP, enabling Earth Spark to sell solar lanterns and other home systems in the South Department of Haiti.

The mini-grid in Coteaux PHOTO: UNEP

PARTNER COUNTRIES

Haiti

- **800 households renting PV charged batteries from a supported social enterprise.** The Norwegian-funded UNEP program has supported the social enterprise Sirona, which has set up a distributed rental scheme for PV charged battery packs.

- **700 households connected via prepaid meters to a cooperative managed mini-grid, with 1 000 forecast by end 2016.** The main component of the UNEP program involved setting up electricity supply via a mini-grid which is owned and operated by the local citizens through the CEAC cooperative: Cooperative d'Arrondissement Coteaux.

- **Three communes serviced by 250 PV powered streetlights benefitting more than 15 000 people.** Street lights are set up along the CEAC mini-grid, giving benefits also to the citizens not directly connected to the mini-grid.

- **27 kilometers of mini-grid medium voltage and low voltage distribution lines reaching out to three villages in the South Department.** The mini grid is stretched along the coastline north of Port Salut, covering the three villages Coteaux, Roche-a-Bateau and Port-a-Piement.

- **Establishment of a national solar training center.** Norway supports SELF (Solar Electric Light Fund) in setting up vocational training for solar PV technicians, promoting employment and local business development.

- **140 kW of solar PV installed to hybridize 400kW of diesel generators** The mini grid is fed by a distributed diesel/solar PV hybrid solution located at four different sites around the three communes.

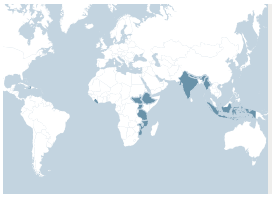
Installation of solar PV panels in Haiti PHOTO: UNEP

Notice: Reportedly, many of these results have been partly or completely destroyed by hurricane Matthew, which struck Haiti on October 4th 2016 when this report was being written. Norway is presently involved in planning support for reconstruction.

PARTNER COUNTRIES

Timor-Leste

In Timor-Leste, Norway supported a programme aimed at facilitating sustainable hydropower development. A hydropower master plan was developed, a draft Energy Law was prepared and a hydrological network operationalized. The programme ended in 2013, a year ahead of schedule, because the Government of Timor-Leste changed its priorities away from clean energy. Norway provided approximately NOK 50 million in grant financing to the energy sector in Timor-Leste between 2007 and 2015.



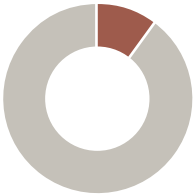
BACK TO OVERVIEW

KEY RESULTS 2007–2015

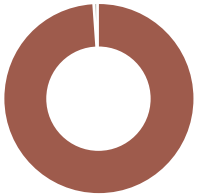
Enabling framework

Hydropower master plan and feasibility studies for 40 MW hydropower prepared (actual)
A national hydrological network established (actual)
Draft water resource law prepared (actual)

20%
Population with electricity access



10%
Rural population with electricity access



99%
Population using biomass for cooking

SOURCE: World Bank 2013

PARTNER COUNTRIES

Timor-Leste

Since independence in 1999, Timor-Leste has relied on expensive diesel generators for power. This has exacerbated the development challenges faced by the nation, with access in rural areas still below pre-independence levels due to lack of human and financial capacity.

Between 2003 and 2013, Norway, through NVE, worked with Timor-Leste's Ministry of Infrastructure to build capacity and improve the efficiency and effectiveness of water resources and power system management. The programme focused particularly on mapping and utilization of hydropower resources.

Key achievements from the cooperation between 2007 and 2015 include:

- **A national hydrological network established.** At the end of 2013, the hydrological network consisted of 31 rainfall stations and 15 water level stations, compared to 13 rainfall stations and only 3 run-off stations in 2008. By 2009, a hydrological database, HYDATA, was in service and by 2011, the National Directorate regularly updated the database for Water Quality Control.
- **A hydropower master plan and feasibility studies for 40 MW hydropower developed.** A hydropower master plan and detailed feasibility studies for the Iralalaru (28 MW), Maliana (2 MW) and Atsabe (10 MW) hydropower projects were prepared under the institutional cooperation with NVE. The master plan found 14 projects with an estimated total capacity of 138 MW to be economically viable compared to thermal power plants fuelled by heavy fuel oil.
- **A draft Water Resource Law prepared but not proposed for adoption by Parliament.**
- **0.3 MW hydropower generation (Gariurai Mini) commissioned.** Norway supported the construction of Gariurai Mini Hydropower Plant. However, the plant was subject to many unforeseen accidents and is reportedly no longer in operation.

Findings from a mid-term review of the cooperation in 2012 prompted a dialogue between the partners to assess the merits of continuing the programme. Although the programme could show good results and achievements, the review report questioned the rationale for continued cooperation. Due to reduced political priority on renewable energy in East Timor the programme was phased out in 2013, one year ahead of schedule.

PARTNER COUNTRIES

India

In India, Norway has supported a broad energy project portfolio to match the varied needs of the energy sector in this vast country. Results range from electrification of villages using solar PV to support the development of a national power exchange. Norway provided approximately NOK 45 million in grant financing to the energy sector in India in the period between 2007 and 2015.

KEY RESULTS 2007–2015

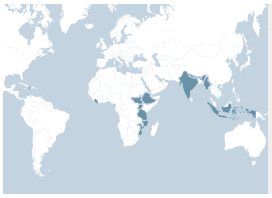
Access	73 solar PV multi utilities set up to create or improve employment for more than 1 750 households (actual) 50 local institutions electrified
Enabling framework	Transferring the Nordic power market experience to India (actual) Improved market governance an viability, and enhanced climate for private investment in the power sector (expected)

81%
Population with electricity access

74%
Rural population with electricity access

67%
Population using biomass for cooking

SOURCE: IEA World Energy Outlook 2015



BACK TO OVERVIEW

India

With a population of more than 1.2 billion, India faces a formidable challenge in providing adequate energy supply to end-users as well as access to electricity. According to the World Bank, approximately 400 million people lack access to electricity, and another 400 million have limited or unstable access.

Key achievements from the cooperation between 2007 and 2015 are:

- **Support to assess the potential applicability and benefits of the Nordic power market experience in India.** The aim of the project implemented by SWECO and the Indian Power Trading Corporation was to examine the fundamentals of the Nordic power market and assist India in analysing the potential applicability and in setting up and operating a national power exchange. A national power exchange has been established in India.
- **Solar based village electrification pilots in 28 villages.** The solar-based village electrification Pilot Public-Private People Partnership between Norway and India, initiated in 2009. The partnership comprised Scatec Solar ASA of Norway, Norad, and the Indian Ministry of New and Renewable Energy. It aimed to increase electrification in rural areas through use of solar PV. Scatec Solar acted as the project coordinator and managed the installation of solar power plants in 28 villages across India. Solar plant operations were transferred to local village electrification committees trained and prepared to manage the period after the Scatec Solar contractual obligation had expired. Sustainable continuation of the operations was, however, undermined by i) under-utilization of the power plants, ii) power tariffs below operation and maintenance costs, iii) lack of firm off-take agreements and iv) no extension or back-to-back agreements catered for with O&M providers. Therefore, several plants are currently faced with technical complications, with some even malfunctioning completely without any contractual party liable to address the issues. The project presents some hard-learnt lessons on the need not to spread across a large geographical area, and to tailor each solar power plant according to village size, power demand and ability to pay for new generation capacity.
- **Supporting Energy and Climate Research at the Energy and Resources Institute (TERI).** The Norwegian Embassy in New Delhi had a framework agreement with TERI from 2009 to 2014, with the aim of addressing global and national concerns for energy security and climate change. Through the ‘Innovating to bring clean energy for livelihood generation in India’ project, about 50 local institutions were electrified, 23 livelihood generation activities created and 140 technical operators trained. In total about 1 750 households reaped benefits from the interventions.

India

KEY PROJECTS

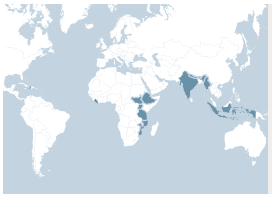
PROGRAMME	IMPLEMENTING PARTNER(S)	TIME PERIOD	AGREED SUPPORT
Potential applicability and benefits of the Nordic power market experience in India	Sweco, Norway; Power Trading Corporation of India	2007 – 2009	NOK 10.4 million
Developing new technology for carbon capture and hydrogen production	Bioforsk, Norway; Indina Institute of Technology, Kharagpur; Uppsala University, Sweden	2008 – 2012	NOK 12 million
TERI Framework Agreement	TERI	2008 – 2014	NOK 57.5 million*
Solar based village electrification pilot	Scatec Solar	2009 – 2011	NOK 16 million
Reservoir Modelling and Simulation Study for EOR	National Geophysical Research Institute, Hyderabad; SINTEF, Norway	2008 – 2014	NOK 12 million

*DAC code 41010 - Environmental policy, laws, regulations and economic instruments.

PARTNER COUNTRIES

South Sudan

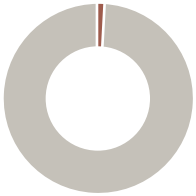
In South Sudan, Norway has supported the development of a modern legal energy framework, financing solar systems for generating electricity to purify drinking water in a refugee camp, and building a new office for the Ministry of Electricity, Dams, Irrigation and Water Resources. Additionally, Norfund studied the potential to invest in a 42 MW hydropower plant, Fula Rapids. All activities were terminated in 2014/15 due to a civil war. Norway provided approximately NOK 40 million in grant financing for the energy sector in South Sudan between 2012 and 2015.



BACK TO OVERVIEW

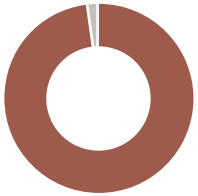
KEY RESULTS 2007–2015

Access	Access to clean water for 24 000 refugees through installation of solar-powered water purification system (actual)
Enabling framework	Development of a draft regulatory framework for the energy sector (actual)



1%
Population with electricity access

0%
Rural population with electricity access



98%
Population using biomass for cooking

SOURCE: IEA World Energy Outlook 2015

South Sudan

Juba, the capital of South Sudan with around 400 000 inhabitants, has a limited distribution network and an installed capacity of 17 MW using heavy fuel oil generators. None of the generators currently operates so there is no electricity supply to the grid; however, there are a few local mini-grids operated by donors or civil society.

The Government of South Sudan requested Norwegian support for power sector development, and invited Norfund to develop the Fula Rapids hydropower project (42 MW) on the Nile. Since 2011, Norfund has led the development of the Fula Rapids project and undertaken studies of the power station and the transmission line, including environmental and social impact assessments. Feasibility studies were completed, and the suggested ownership structure of the project was Norfund 24 per cent, Aldwych International Ltd. 51 per cent, and the Government of South Sudan 25 per cent.

Norway has also provided institutional capacity building through an NVE technical assistance programme with the Ministry of Electricity, Dams, Irrigation and Water Resources. However, it has been difficult to carry out planned activities since 2013 because of security travel restrictions, outstanding staff salary payments and a lack of experienced and professional staff at the Ministry.

Due to civil unrest in South Sudan starting in December 2013 and little progress towards peace in 2014 and 2015, all programmes closed in 2014/15.

Key achievements from the cooperation between 2012 and 2015 include:

- **Establishment of a modern energy legal framework.** A new Electricity Law has been prepared through the cooperation between the Ministry of Energy and NVE, along with technical regulations for i) electrical installation work regulations, ii) electricity safety regulations, iii) wiring regulations, and iv) reporting, tariff setting, metering, settlement and billing. The law and regulations are ready for enactment by the Parliament. Once adopted, this legal framework will provide for predictable and transparent management of the energy sector, and fulfil the requirement of most hydropower developers.

- **A distribution system development plan for Juba.** Detailed analysis of the distribution system in Juba was carried out as part of the cooperation between the Ministry and NVE to identify the key challenges and improvement requirements to accommodate electricity supply from outside of the capital (such as hydropower from Fula Rapids). Key outputs included a distribution system development plan for Juba.

- **A new office building for MEDIWR.**

PARTNER COUNTRIES

South Sudan

- **Mobilized private investors for the 44 MW Fula Rapids HPP.** Norfund has spent considerable resources on developing Fula Rapids, and currently own a share of the planned project. A legal team financed by Norway successfully assisted the Government of South Sudan in their negotiations with the developer.

- **24 000 inhabitants gained access to a solar system that generates electricity to purify water in the Kaya refugee camp.**

Conducting hydrological studies for the Fula Rapids HPP. PHOTO: MULTICONSULT

KEY PROJECTS

PROGRAMME	IMPLEMENTING PARTNER(S)	TIME PERIOD	AGREED SUPPORT
Initial works to prepare Fula Rapids for construction	Norfund	2013 – 2015	NOK 40 million
Electricity sector capacity building	NVE	2014 – 2015	NOK 5 million
Construction of office building for MEDIWR	UNOPS	2012 – 2014	NOK 22 million
Legal Transaction Advisor	NVE	2012 – 2015	NOK 9.5 million

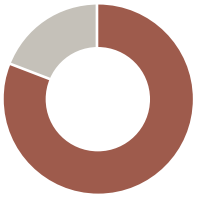
PARTNER COUNTRIES

Indonesia

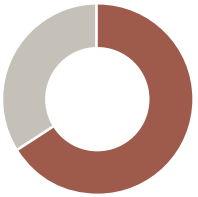
In Indonesia, Norway has contributed to developing small-scale renewable energy solutions. Results include 700 new jobs and improved livelihoods. Norway has provided grants of approximately NOK 35 million since 2007.

KEY RESULTS 2007–2015

Access	2 195 bio digesters with a total of 7.7 GWh/yr biogas energy content (actual)
Generation	27 kW micro-hydro (actual) 44 kW solar PV (actual)
Enabling framework	Supported the pilot project that led to a national electrification programme for Indonesia (actual) Supported a technology park educating more than 2 000 students on renewable energy (actual)



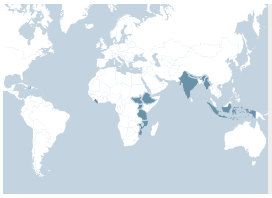
81%
Population with electricity access



66%
Rural population with electricity access

39%
Population using biomass for cooking

SOURCE: IEA World Energy Outlook 2015



BACK TO OVERVIEW

PARTNER COUNTRIES

Indonesia

National plans to increase the use of renewable energy in Indonesia have existed since 2007, and as part of this the government requested Norwegian assistance to develop models for small-scale renewable energy solutions in remote areas. The island of Sumba is a pilot area where local authorities in collaboration with the national government, local communities, non-governmental organizations and donors aim to provide access to electricity generated entirely from renewable energy sources.

Key achievements from the cooperation between 2007 and 2015 include:

- **Renewable energy to households, schools, businesses and job creation on Sumba Island.** The programme, implemented by HIVOS, aimed to facilitate a stakeholder consultation process to replace fossil fuels with renewable energy. HIVOS also showcased renewable energy installations (27kW micro-hydro, 2 195 biogas plants, a solar irrigation system, and 44kW solar PV in schools). Development of income-generating activities also created 180 new jobs.

- **500 new jobs and energy produced from household biogas.** The purpose of the project is to promote a market-oriented domestic biogas sector that provides access to affordable clean energy for livestock and dairy farmers through the dissemination and application of biogas technologies. The project also helps the target group develop income-generating activities based on biogas. The project has installed bio-digesters in total producing 3 512 cubic metres of renewable biogas every day (with an energy content equivalent to 7.7 GWh/year). In addition, 500 new jobs have been created, household savings are USD 700 on average per year, and crop production has increased by 10 per cent.

- **Lessons from Sumba Island brought to national level.** Based on all the lessons learned from Sumba, ADB developed a report on the national electrification challenge and provided inputs to the government that led to the announcement of a national electrification programme for Indonesia.

- **Established Baron Technopark.** Norway provided support to develop this as a small demonstration area, and training in renewable energy for schools and university students in Yogyakarta and surroundings. The Technopark is still functioning, and has so far served more than 2 000 students.

Indonesia

KEY PROJECTS

PROGRAMME	IMPLEMENTING PARTNER(S)	TIME PERIOD	AGREED SUPPORT
Development of IPP mini-grids on Sumba Island	Asia Development Bank	2013 – 2015	NOK 6 million
Renewable energy pilots on Sumba island	HIVOS	2013 – 2016	NOK 4.9 million
BIRU Project	HIVOS	2013 – 2016	NOK 5.9 million
Baron Technopark	Indonesian Agency for Assessment and Application of Technology (BPPT)	2009 – 2012	NOK 6.5 million

Biogas in use on Lombok, Indonesia. PHOTO: HARALD BIRKELAND

Angola

In Angola, Norway has helped build an enabling framework for much needed investments in the country's energy sector through i) a modern legal framework, and ii) building systems for collection and analysis of hydrological data.

Angola has considerable untapped hydropower potential, but weak institutions and regulatory framework has held back private investments. Based on a request for assistance from the Angolan Ministry of Energy and Water, the Norwegian Embassy in Luanda entered into an agreement with NVE in 2013 with the objective of building capacity to develop Angola's renewable energy resources and promote efficient use of electricity.

Work on a revision of the Electricity Law started in 2014 as a joint effort by the Ministry and NVE involving several rounds of drafts. A key milestone was reached in December 2015 when the revised Law was enacted, laying the foundation for continued reform in the sector, including revision of the following pursuant regulations.

In addition to strengthening the Ministry's ability to coordinate and implement policy, this work has also been instrumental in enabling Angola to fulfil some of the requirements for accessing a USD 1 billion AfDB credit for developing the power sector.

China

The environmental NGO WWF works in partnership with companies as part of their Climate Savers Program to set and meet goals to reduce carbon emissions. In China, WWF works with Yingli Green Energy to increase energy efficiency and reduce greenhouse gas emissions directly from their production of solar photovoltaic, but also throughout the products' value chain. In 2014, Yingli Green Energy exceeded its emissions reduction target, two years early. According to figures that have been verified by external consultants, Yingli reduced its emissions between 2010 and 2013 by 390 000 tons of CO2 equivalent.

Ghana

Ghana has a number of dams that have not been sufficiently maintained and thus suffer from structural weaknesses, making dam breaches and failures a real threat to public safety. NVE has provided expertise in legal, technical and economic aspects of dam safety, as well as support to establish a dam safety unit to enforce safety measures. NVE and Ghana's Water Resources Commission (WRC) cooperated from 2010-2013 in a NOK 7 million program to establish the National Dam Safety Unit of Ghana in an effort to minimize the serious threat to society by potential dam breaches and failures.

During the programme, the WRC, with the assistance of NVE, developed a proposal for legal framework through a revision of the dam safety regulations, and prepared technical guidelines and a dam safety manual, as well as a national database on dams. The work involved extensive stakeholders consultations. WRC personnel were trained by NVE experts in enforcing the new legal framework through inspection and compliance monitoring and is today carrying this out themselves. The cooperation lead to a financial mechanism (fee) being put in place to sustain the Dam Safety Unit's operations, increased interaction between stakeholders, and raised awareness on dam safety.

Laos

The Government of Norway has been instrumental in developing the Lao energy sector since the early 1990s, through modernizing the water resource management and electricity legislation in Lao PDR and has supported development of the country's hydro power potential. Norad has financed feasibility studies for several hydro power plants and then supported the development and construction, with new installed capacity added to the Laotian electricity grid. Norad has also co-financed rural electrification programs with the World Bank through two phases. The second phase of this project was completed in 2015, with a dual target of increasing access to electricity of rural households and improving the financial performance of Electricite du Laos. More than 47 000 new households were electrified, exceeding the target outcome, and improving the utility's financial performance.

Further information can be found in Norad's Clean Energy annual report 2011 and 2012.

Panama

SN Power received training support in 2011 related to the construction and operation of a 58 MW hydropower plant in Panama, that was completed in 2015.

Togo

Naturvernforbundet reports that partner JVE provided equipment to three small stove businesses in order to increase their market coverage in Togo. One of the stove factories was able to secure new contracts and strengthen their staff in both production and administration. Naturvernforbundet reports the sale of 20 000 units of improved cooking stoves in this program supported by Norad.

South Africa

Norad provided grant support to the Norwegian company Scatec Solar in 2011 for partial financing of a feasibility study of solar power in South Africa. This was the start of Scatec's investments in solar power plants in the country. Scatec Solar has thus provided South Africa with 190 MW solar power, with construction of another 258 MW to start soon. Towards the end of 2018, Scatec Solar aims at providing 700 MW on the African continent.

The South African Renewable Energy Independent Power Producer Program (REIPPP) has been successful in mobilising private investments in clean energy projects. It serves as an inspiration to other countries in Southern Africa. Norway decided last year (2015) to support a project proposal from the University of Cape Town (UCT) that aims at exporting the unique South African experience and capacity to other parts of Africa. The objective is to make sure this knowledge can benefit other countries too. Norway provides financial support to professor Anton Eberhard at the UCT that enables him and his team to assist countries in Sub-Saharan Africa to design and run effective renewable energy auctions that will build a pipeline of bankable projects. These will deliver electricity at competitive prices. Already we see countries such as Tanzania, Kenya, Ethiopia and Zambia making commitments to run competitive tenders or auctions for grid-connected solar and wind power projects.

Vietnam

Hydropower is one of the most important natural resources of Vietnam and the most important source of renewable energy. In order to ensure a sustainable development of the country's hydropower resources Norad and Sida jointly financed the National Hydropower Study (NHP) in 2000 to assist Electricity of Vietnam (EVN), with NVE in an advisory role. The NHP, which was carried out by consultants, was finalized in 2007 and mapped Vietnams hydropower resources and presents a ranking of projects according to technical, economic and environmental scores, providing EVN with a unique tool for sustainable development of the resource. The NHP study concluded that 50 out of 80 assessed hydropower projects were considered as sustainable based on economic, environmental and social indicators.

The NHP study was followed by an institutional cooperation between NVE and Department of Water Resources Management (DWRM) and Ministry of Natural Resources and Environment (MONRE) focusing on improving the hydropower licensing procedures in Vietnam. Main results of the institutional cooperation which ended in 2012 has been new licensing guidelines, including preparation of standard license documents and establishment of a database, and capacity in government staff to enforce their mandate. The NHP study and licensing assistance has laid the foundation for major development of Vietnmans hydropower resources the last decade. Several of the top ranked projects in the NHP study have been commissioned (Hua Na, Khe Bo, Nho Que 3, Song Bung 4) or are under construction (Trung Son, Song Bung2, Dak Mi 1). Today all new hydropower projects are issued with a license according the defined licensing procedures giving both developers and authorities predictability and transparency in the project development.

Further information can be found in Norad's Clean Energy annual report 2011.

Nicaragua

Despite a large potential for alternative energy production, Nicaragua remains heavily dependent on energy import and fossil fuels. The government's goal is for clean energy to make up 90 percent of the energy mix by 2020. The Government of Norway has since 2009 supported a programme to build 12 small-scale hydroelectric plants in off-grid areas in the Northern Atlantic Autonomous Region and the Central Region; home to some of the poorest rural communities in the country. The programme is driven by the Nicaraguan government together with the United Nations Development Programme, and has strengthened the capacity of local communities to manage the watersheds to ensure sustainability of the water flow and investments, and to run local electricity companies to set up and manage the hydroelectric plants. The programme has also contributed to strengthening the capacities of the Ministry of Energy and Mines in order for it to undertake similar initiatives in other locations.

Further information can be found in Norad's Clean Energy Annual report 2011 and 2013.

7 Capacity building

» Capacity building and institutional development is a priority in Norwegian bilateral energy cooperation. The term comprises an array of interventions of shorter and longer duration that may have an immediate focus on adding capacity (or filling gaps) or longer-term capacity building interventions, particularly designed to transfer skills and knowledge at the individual and/or institutional level.

NVE workshop in Vietnam 2009, Gia Lai Province. PHOTO: KNUT GAKKESTAD

PREVIOUS VIEW

The Clean Energy Initiative emphasizes legislation, energy system planning, data collection, and other frameworks and capacities that strengthen the foundation for commercial investments and improve natural resource management and environmental protection. Capacity building supported by Norway may also target activities that facilitate regional power trade, and capacity strengthening through short courses and higher education, vocational training centres and research institutions.

Twinning arrangements have been an important model of support for capacity building, involving Norwegian government departments and public sector companies providing technical input and longer-term capacity support to national counterparts.

Also other projects supported, such as infrastructure projects, often contain elements of capacity building and on-the-job training.

TABLE 10 // EXPENDITURE ON CAPACITY BUILDING 2007-2015

CATEGORY	INSTITUTION/PROGRAM	SUM DISBURSED (MILL NOK)
Institutional twinning	NVE Statnett NGI	384 94 7
Research and higher education	EnPe Phase I EnPe Phase II NOMA NUFU GLOBMEK/NORGLOBAL	22 10 29 7 17
Short term courses	ICH	76
Vocational training	Butwal/Nepal, Arusha/Tanzania	8

Trough institutional twinning projects Norway has contributed to improved sector governance and/or more efficient power utility operations in 11 different partner countries. Within the field of renewable energy, Norwegian programmes for research and higher education has supported 219 master and 25 PhD students and the strengthening of institutions in eight partner countries.

The table above lists indicative expenditures on different types of capacity-building interventions related to energy between 2007 and 2015.

INSTITUTIONAL COOPERATION

Institutional development and long-term capacity building has proved effective in improving energy sector management and the investment climate. In addition, the interventions are in most cases focused

on providing improvements in the regulatory framework that enhances public sector efficiency, and helps attract private investments in generation capacity. However, providing exact figures and specific results as well as ensuring the relevance, effectiveness and sustainability of such interventions remains a challenge for the Clean Energy initiative.

The complexity involved in measuring the impact of institutional cooperation projects is discussed at length in the Clean Energy Annual Report 2013, with examples from Uganda, Nepal and Bhutan. Recent experience from institutional cooperation, including the Auditor General's Review of the Clean Energy Initiative, suggests that weakness in the planning of capacity-building projects creates problems in implementation and results reporting. This is also consistent with findings in evaluations of capacity-building projects in different sectors, for example the recent Norad evaluation report 10/2015. NVE, Norad and the embassies are now addressing these issues.

Water measurement education in Bhutan. PHOTO: KJELL REPP (NVE)

Hydrological field work in Liberia. PHOTO: KJELL REPP (NVE)

The Norwegian Water Resources and Energy Directorate (NVE)

NVE is regulator for the power market in Norway, responsible for ensuring an integrated and environmentally sound management of Norway's water and energy resources. NVE's development cooperation work is organized through its International Section that draws on resources and expertise from the whole organization as needed.

NVE has supported partner institutions in Angola, Bhutan, Ethiopia, Ghana, Mozambique, Myanmar, Tanzania, Timor-Leste, Vietnam, Nepal, South Sudan and Liberia from 2007 to 2015. More information about each intervention can be found in the respective sections of Chapter 5. In most cases, issues related to legislation, hydrology and licensing are addressed.

NVE promotes gender mainstreaming in all development cooperation projects.

BOX 14 // INSTITUTIONAL COOPERATION

Liberia Hydrological Services

Liberia Hydrological Service in the field. PHOTO: NVE

"If NVE had not come our way we would not have been able to collect data today," says Mr. Jefferson W. Wylie, director of the Liberia Hydrological Services (LHS). Over the past five years, the MLME-NVE institutional cooperation has built a well-functioning hydrological network that covers the key river basis in Liberia. The network is now fully operated by LHS, and the data have been used for the Mt. Coffee hydropower plant. If continuous records are kept, these data will prove invaluable to the future development of the Liberian power sector.

The following key success factors are identified by stakeholders:

1. **Local ownership**
   LHS were closely involved in the design of the intervention, and have had control throughout its implementation.

2. **Dedicated counterparts**
   LHS dedicated eight staff member to work with the resident advisor for the duration of Phase I. Many had little or no pre-existing hydrological experience, but technical skills and competencies were transferred through on-the-job training.

3. **Resident advisor**
   The stakeholders agree that the presence of a hands-on NVE resident advisor was critical for the capacity building that has taken place.

4. **Clear and realistic objectives**
   LHS and NVE set out to establish the hydrological network, and enable LHS staff to operate it. These objectives were clearly identified and pursued.

5. **Holistic approach**
   In addition to competence for capacity building, the programme has also provided LHS with all the equipment required to operate and maintain the network.

Statnett

Statnett SF is the Norwegian Transmission System Operator (TSO), charged with security of the electricity supply in Norway, and with facilitating an efficient power market. Statnett owns and operates the Norwegian main grid and is part owner of the Nordic Power Pool.

Between 2007 and 2014, Statnett was engaged in capacity-building projects with the national power utilities in Kenya, Uganda and Tanzania. The purpose of the projects was to improve the core TSO functions by sharing practices and conducting long-term on-the-job training. The projects addressed topics such as power system operation, grid maintenance, system planning and investment project implementation. Also, more general issues such as health, security and environment, information technology systems, and management training were addressed.

In 2014 Statnett made a decision to disengage from international development cooperation due to pressing national priorities.

RESEARCH AND HIGHER EDUCATION

Norway supports several higher education and research programmes aimed at strengthening the knowledge base as well as institutional capacities of partner countries. There are competitive calls for proposals, and funding decisions are supported by peer review.
The following programmes have supported energy-related projects:

- Norad's Master's Programme for Energy and Petroleum (EnPe) 2009-15 (phase one) and 2014-19 (phase two)
- The Norwegian Programme for Development, Research and Education (NUFU) 2007-2012
- Norad's Programme for Master Studies (NOMA) 2006-2014
- Globalisation of environment, energy and climate research (GLOBMEK), under the research programme "Norway – Global Partner" (NORGLOBAL) 2010-2015

Norway supported a total of 219 master's and 25 PhD students enrolled within the field of renewable energy through the NUFU, NOMA, EnPe and Quota Scheme programmes in the period between 2007 and 2015, including in Nepal, Ethiopia, Mozambique, Malawi, Uganda and Tanzania.

Graduation of Nepalese participants in Norad's Master's Programme for Energy and Petroleum (EnPe). PHOTO: BRIJESH ADHIKARY

Master's programmes

Master's programmes have been supported through Norad's Master Programme for Energy and Petroleum (EnPe, 2009-2015) and Norad's Programme for Master Studies (NOMA). The first phase of EnPe (2009-2015) focused on training staff in the energy and petroleum sectors in Norway's partner countries. Student exchange and capacity building at higher education institutions in developing countries through collaboration with Norwegian higher education institutions was a key modality of support. The second phase of EnPe (2014-2019) includes a stronger focus on research, infrastructure and system strengthening at the institutional level. The programme is funded by Norad, and a programme secretariat is based at the Norwegian University of Science and Technology (NTNU). A programme board, including representatives from industry, higher education institutions and Norad, makes decisions regarding project allocations.

NOK 22 million of a total programme budget of NOK 54 million was allocated to five projects with a focus on renewable energy in the first phase. The five projects are collaborations between NTNU in Norway and higher education institutions in Uganda, Ethiopia, Nepal and South Africa.

Key achievements from the first phase:

- Established various programmes relevant to partner country needs (Electrical Power Engineering at Kathmandu University, Energy Technology Science at Mekelle University in Ethiopia, Planning and Operation of Energy Systems at Kathmandu University, and Sustainable Energy Science at the University of Witwatersrand in South Africa). Teaching, organizational and financial management responsibilities have gradually been transferred to partner country universities. Investments in laboratories and personnel training, libraries and ICT equipment have been crucial for the institutions to sustain capacity after the projects have ended.
- 60 master's students within the field of renewable energy. In addition, government or industry in partner countries sponsored some students. Industry has also contributed with supervision and teaching in several projects. This ensured a high degree of relevance of the education programmes and attractive candidates for the labour market.
- More than 30 per cent of master's students have found employment in the energy sector, and 40 per cent have found employment in the higher education institutions in their home country. The remainder are working for relevant government bodies or have pursued further studies.

› Four PhD candidates within the field of clean energy have graduated. All the PhD candidates have become key personnel in their academic institution.

Norway emphasizes female participation in a field traditionally dominated by men. Around 30 per cent of the financed master's students were women. However, all PhD candidates have been men.

For the ongoing second phase, EnPe II, about half the total programme budget of NOK 100 million has been allocated to renewable energy projects. So far, the programme has granted support to four regional projects within the field of renewable energy involving universities in Ethiopia, Mozambique, Malawi, Tanzania, Uganda, Ghana and Nepal. The focus is on solar energy, bioenergy and energy technologies. NTNU and the Norwegian University of Life Sciences (NMBU) are partner institutions in Norway. So far, 56 master's students and four PhD candidates have enrolled. Two of the PhD candidates recruited are female.

East African Renewable Energy Centre of Excellence at Makerere University, Uganda

One result of the EnPe programme is that the East African Renewable Energy Centre of Excellence at Makerere, in close cooperation with the University of Dar es Salaam (Tanzania) and other regional partners, was established. The Centre attracts high-level research funding from industry and other development agencies. It offers consultancy services, develops products and patents, and acts as an incubator for businesses.

The Norwegian Programme for Development, Research and Education (NUFU)

The Norwegian Programme for Development, Research and Education (NUFU) provides support to the development of sustainable capacity and competence for research and research-based higher education relevant to national development and poverty reduction in developing countries.

During the project cycle 2007-2012 the programme supported three projects within the field of clean energy, including i) solar radiation measurements and potential use of solar energy in Nepal and China, ii) Alternative Energy for Sustainable Development, Environmental Protection and Poverty Reduction in Tanzania, and iii) thermal solar energy in Mozambique, Ethiopia and Uganda.

Ole Jørgen Nydal (NTNU) discussing new solutions with a scientist in the energy laboratory at Makerere University, Uganda. PHOTO: OLE JØRGEN NYDAL (NTNU)

Developing future leaders in renewable energy, Makerere University, Uganda

Uganda and Norway have had a long-term cooperation regarding education in the field of energy. Through this cooperation, links across multiple disciplines and institutions have been forged, such as the partnership between Uganda's leading university, Makerere, NTNU in Trondheim and the University of Bergen, Norway (UiB). In the field of clean energy, Makerere University and NTNU have implemented a national programme for development research and education (NUFU). To date, 16 Ugandan students have graduated from the master's programme and around 15 students will graduate per year in the coming years. Furthermore, at least 45 Ugandan students have benefited from an exchange programme to NTNU in the period 2000–2015 as part of the internationally respected master's course in hydropower.

Globalisation of environment, energy and climate research (GLOBMEK)

Globalisation of environment, energy and climate research (GLOBMEK) was launched in 2010 under the broader research programme "Norway – Global Partner" (NORGLOBAL). NORGLOBAL aims to strengthen Norwegian research on and for development in low- and middle-income countries, as well as research capacity in these countries. GLOBMEK focus in particular on environment, energy and climate research, and increase the opportunities for researchers from developing countries to participate in research on these issues. Between 2010 and 2015, NOK 17 million was allocated to five projects within the field of renewable energy.

Dennis Okello (PhD-student from Makerere University, Uganda) is conducting heat storage measurements at the NTNU laboratory in Trondheim, Norway

PHOTO: OLE JØRGEN NYDAL (NTNU)

Cooking using the sun as fuel, an example of research supported through the "Norway – Global Partner" programme

The hunt for cooking fuel is becoming ever more pressing in rural areas in many developing countries. Cooking with solar energy can make people's lives easier and improve health. Even so, many distributed solar cookers remain unused. Researchers at the Norwegian University of Science and Technology (NTNU) in collaboration with Eduardo Mondlane University in Mozambique and the University of KwaZulu-Natal in South Africa believe that research and enhanced knowledge can change this. This was the premise for the start-up of several parallel research projects between NTNU and six African universities, collectively entitled "Cooking with the sun – a comparative country analysis of Solar Cooking, its adoption and impacts on people's lives." The project examines the social framework conditions that affect people's choice of energy sources and technical approaches to identify new solar energy solutions based on solar heat storage. Heat storage allows solar cookers to be used after sunset and during cloudy weather, making their use more flexible and practical.

The project has resulted in the establishment of solar laboratories, and a regional network of solar researchers with staff and graduates in the natural science and social science fields. Several projects have been coordinated to provide synergies on the technical (NUFU, NRC, NTNU, Quota Scheme), social (NORGLOBAL) and educational aspects (NOMA, EnPe) of the work.

SHORTER TERM COURSES FOR ENERGY PROFESSIONALS

The International Centre for Hydropower, ICH, was established in 1995 to serve as a key partner in the transfer of knowledge through training programmes, workshops and seminars designed to improve competencies of energy sector personnel.

Since its establishment, ICH has developed and offered tailor-made programmes spanning the entire knowledge spectrum of the hydropower sector, including planning, design, construction and sustainable operation of hydropower facilities as part of a mixed energy system as well as multipurpose projects.

ICH programmes address theoretical and practical issues related to current international trends with regard to restructuring of the energy sector, focusing on technical aspects, financial issues, legal frameworks, climate change, environmental and social issues among others. These courses have a duration of 1-3 weeks,

and are held annually or biannually, in Norway or in cooperation with a partner organization in Africa, Asia, Latin America or Europe.

Establishing close cooperation with institutions such as Hydro Lab in Nepal and Kafue Gorge Regional Training Centre in Zambia has been instrumental to ICH's regional activities. These centres have good infrastructure and are conveniently located in important regions with large needs for capacity building.

Conflict Resolution. Chile 2015

"As an indigenous community leader I can state that the activity of ICH was a very interesting learning experience, encountering situations in relation to water projects, the importance of socializing, negotiating and integrating the different types of actors at territorial level. I suggest doing these courses to officials and indigenous leaders."

– OSCAR HUEHUENTRO M. MAPUCHE INDIGENOUS LEADER

"Encouraging women's participation, not only as course participants from the utilities, but also as facilitators in delivering lectures on various topics and technical excursions. Notable in this regard have been Ms. Wizaso Munthali from the Copperbelt University in Zambia, Mrs. Elenestina M. Mwelwa from ZESCO, Mrs. Moono M. Kanjelesa from the Zambia Environmental Management Authority and Victoria Namubiru from UMEME, Uganda. This aspect has helped to raise the profile of women in decision making within their respective organizations."

– KAFUE GORGE REGIONAL TRAINING CENTRE 2015 STATUS REPORT ON COOPERATION WITH ICH

Kafue training centre. Facilities for practical training. Maintenance of intake gates. PHOTO: KNUT GAKKESTAD

ICH programmes are extensive and are run in sequences that gradually build participants' skills in various areas and develop their capabilities, empowering them to work independently with the capacity to assess, implement and evaluate their nations' projects. These courses bring significant improvements and are expected to reduce technical and commercial inefficiencies in the sector.

Courses also facilitate the review and formulation of appropriate policies and institutional frameworks through the engagement of decision makers and other stakeholders including government agencies.

The participation of women is at the core of ICH's strategy, as ICH not only actively advocates for the involvement and participation of women in the energy sector, but also works towards their equitable integration in the sector by engaging them both as resource persons and participants in its activities. This has been borne out by the steady increase in the participation of women in the sector from only 5 per cent in 2007 to 30 per cent in 2015. Indeed, during the reporting period, of the 3 107 sector professionals that participated in ICH activities, 601 were women.

Vietnam study visit to Kjøsnesfjorden power station in Norway in 2010 organized by NVE. PHOTO: KNUT GAKKESTAD

ICH lecturers and resource persons are well-known specialists within their field, and they have extensive international and regional experience. ICH continues to cultivate and use the skills and knowledge of retired and long-serving industry experts, whilst facilitating succession planning by encouraging the participation and involvement of younger sector professionals.

VOCATIONAL TRAINING

Arusha Technical College, Tanzania

Norway supports Arusha Technical College (ATC) in Tanzania, a vocational college that aims to rehabilitate and further develop the Kikuletwa hydropower plant and provide a training programme for hydropower technicians.

Constructed in the 1930s, the 1.5 MW Kikuletwa plant was one of the first in Tanzania. It provided electricity to the towns of Arusha and Moshi for many years and later supplied electricity into the national grid, but ceased operation in 1984. In 2014 TANESCO handed the ownership to ATC.

ATC will also use Kikuletwa as a training centre for hydropower technicians and artisans and as a test centre for its own micro-turbine generator. In five years, the college has significantly increased the number of students and established several new studies. The proportion of female students increased from 12 to 22 per cent through an active commitment.

NVE and ICH have been engaged to support ATC in rehabilitating the power plant, and develop a hydropower training programme in collaboration with Kafue Gorge Regional Training Centre in Zambia.

Butwal Technical Institute, Nepal

The Norwegian engineer Odd Hoftun established the Butwal Technical Institute in 1963. Since its inception, hundreds of students have received theoretical training at the institute and been exposed to industrial environments through apprenticeships. Today, a large proportion of the students are from poorer segments of society and the institute aims systematically at training girls.

Between 2007 and 2015, more than 800 students graduated from BTI, including 65 girls, decades after Norway helped establish the institute. Most of these courses have a duration of more than one year. Many BTI students have established their own businesses and Butwal has become an industrial hub. The institute has therefore been a driving force for the development of local enterprise in the Lumbini region. BTI graduates in Butwal currently direct at least 45 electromechanical companies, which employ over 1 000 people.

Female students at Butwal Technical Institute. PHOTO: INGE HARALD VOGNILD

8 Regional energy cooperation

»Support to cross-boundary energy cooperation helps promote regional integration and peace, more efficient utilization of infrastructure, and improved management of natural resources.

PHOTO: KEN OPPRANN

Norwegian support to regional energy cooperation has contributed to the development of power trade in the Southern and Eastern African regional power pools, with a significant volume traded in the Southern Africa Power Pool day ahead market. Norwegian support to feasibility studies of regional infrastructure projects has contributed to the bankability and ongoing construction of the 80 MW Rusumo falls hydropower project and the 510 km transmission line between Kenya and Tanzania.

TABLE 11 // NORWEIGAN SUPPORT TO REGIONAL POWER POOLS

PROGRAMME/DESCRIPTION	PERIOD	EXPENDITURE (MILLION NOK)
Southern Africa Power Pool (SAPP): Support to infrastructure planning and establishment of a competitive market	2004 – 2017	41
East African Power Pool (EAPP): Capacity building to operationalize the Coordination Centre and the Independent Regulatory Body	2009 – 2016	30

REGIONAL POWER POOLS

Through the integrated Nordic power market and its joint facility for power exchange, Nord Pool, Norway and the other Nordic countries have vast experience in cross-border power trade. Norwegian competence in this field have been used to support establishment of frameworks for cross-border trade in Southern and Eastern Africa.

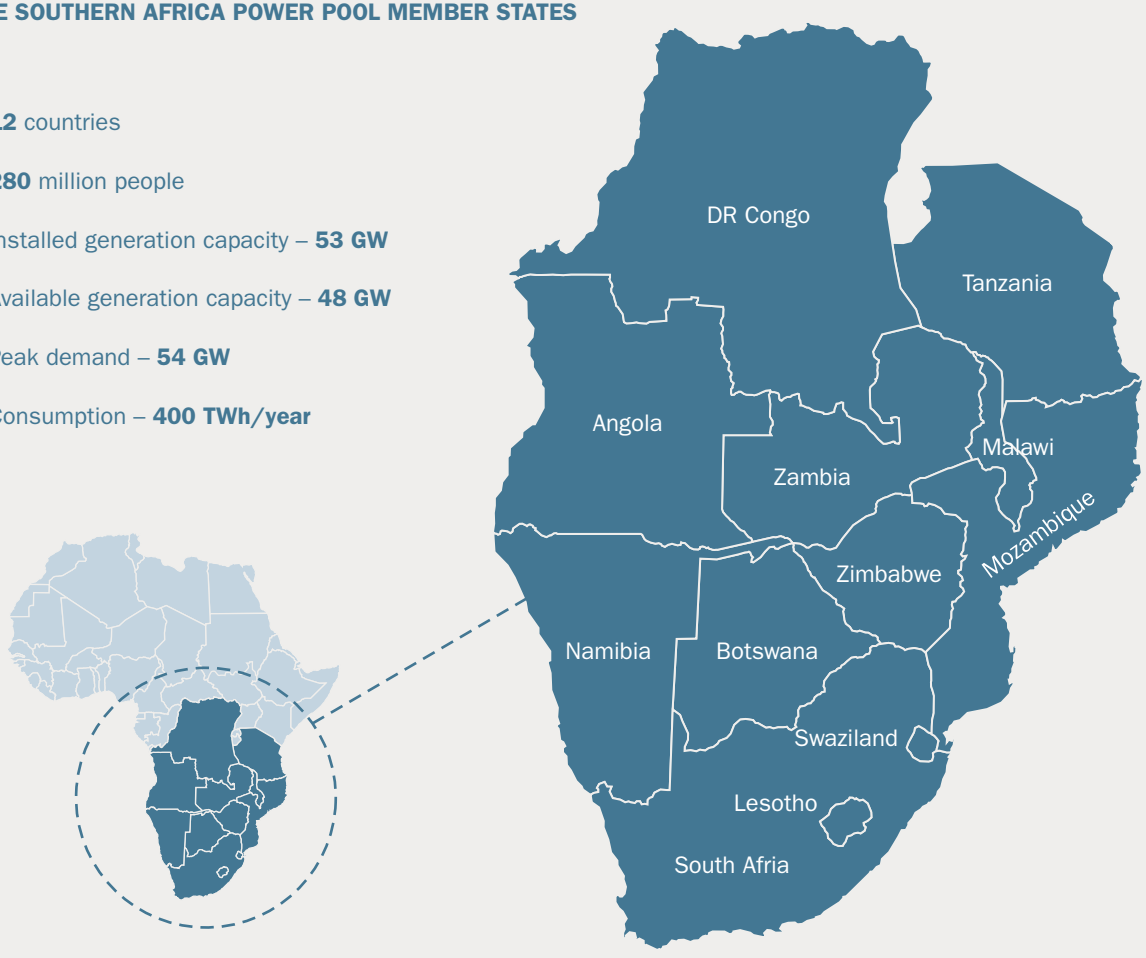
The Southern Africa Power Pool (SAPP) was established by the Southern African Development Community (SADC) in 1995 to coordinate twelve SADC countries' power systems. SAPP has the largest volume of power traded in Africa and is the only power pool with some form of competitive power market. Power trading increased from 84 Gwh in 2013, 508 Gwh in 2014 to more than 900 Gwh in 2015 Norway has taken a long-term perspective on its support to the development of SAPP, focusing particularly on online regional power trading. The trading system's technical solution is based on Nord Pool principles.

The Eastern Africa Power Pool (EAPP) EAPP was established in 2005 as a special institution of the Common Market for Eastern and Southern Africa. EAPP is an intergovernmental body and members of EAPP include public or concessionary utilities of member countries, including Burundi, DRC, Egypt, Ethiopia, Kenya, Libya, Rwanda, Sudan, Tanzania and Uganda. The mandate of EAPP is to coordinate power generation and transmission projects for integration of the region's power systems.

Since 2008, Norway has provided financial and technical support to operationalize the key EAPP institutions, including the Secretariat, the Coordinating Committee and the Independent Regulatory Body, which was created to provide regulatory services to the regional power market and reports to the Council of Ministers.

THE SOUTHERN AFRICA POWER POOL MEMBER STATES

- **12** countries
- **280** million people
- Installed generation capacity – **53 GW**
- Available generation capacity – **48 GW**
- Peak demand – **54 GW**
- Consumption – **400 TWh/year**



Source: SAPP 2014.

Key achievements from support to SAPP include:

- A professional institution with responsibility for regional power market oversight.
- A day-ahead market (DAM), a fully competitive auction market, open to utilities, independent power producers, transmitters and distributors.
- A target volume of trade for the DAM reached – initially at around 1 per cent, the target was to increase to 5-10 per cent of total power trade. In financial year 2012/13 the volume increased to 6 per cent, and in 2013/14 to 17 per cent. Increased trade has contributed to a significant increase in revenue for SAPP.

PREVIOUS VIEW

Key achievements rom the support to EAPP include:

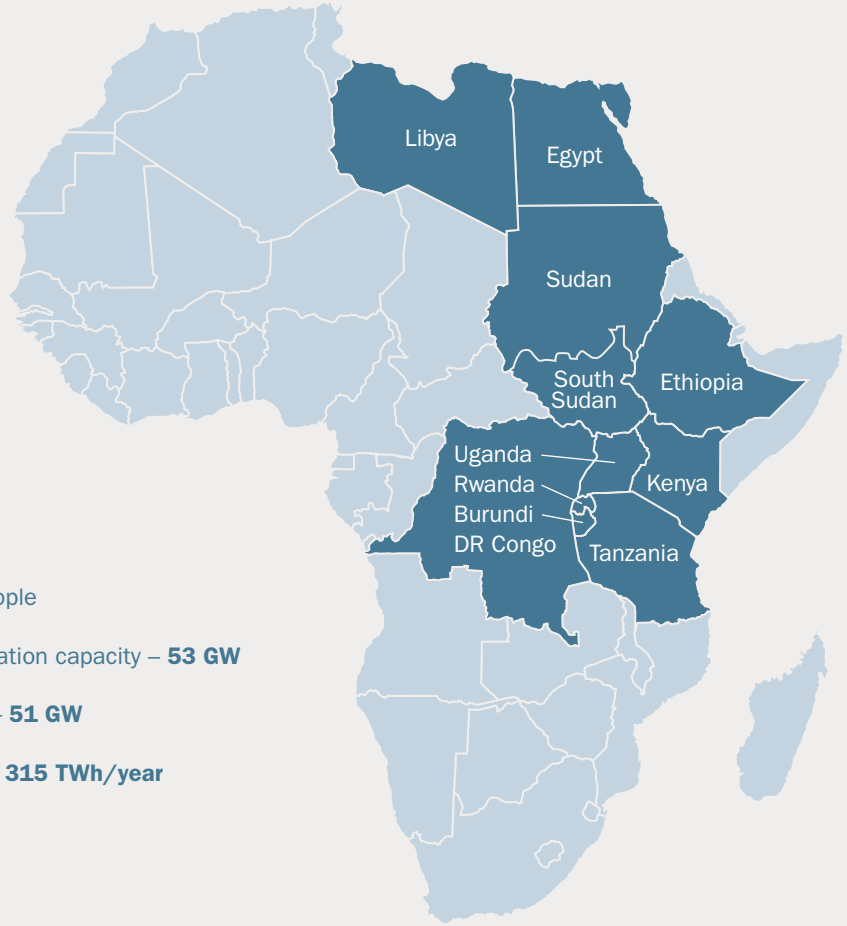
- A Regional Power Master Plan for least-cost development of infrastructure developed and updated, and projects for regional grid development studied prioritized, developed or approved.

- Necessary agreements for transmitting power from Ethiopia to Tanzania through Kenya, negotiated and signed with transaction advice from USAID/Power Africa.

- A regional grid code to govern the operations of the regional interconnected electricity network prepared and signed off as a COME-SA harmonized standard, and pilot projects undertaken to implement and test the code.

EAPP is still in its early stage of development and remains the least developed power pool in Africa in terms of traded volumes. Significant supply is about to come on line in Ethiopia and in other countries. Advancing regional energy projects will be critical to enable trade and the development of a regional market.

EASTERN AFRICA POWER POOL MEMBER STATES



- **12** countries
- **386** million people
- Installed generation capacity – **53 GW**
- Peak demand – **51 GW**
- Consumption – **315 TWh/year**

PREVIOUS VIEW

REGIONAL INFRASTRUCTURE PROJECTS

Norway supports in addition feasibility studies for a number of regional infrastructure projects aimed at improving supply security and improved resource efficiency.

Uganda–DRC interconnector

This transmission line is a priority project under the Nile Equatorial Lakes sub-regional system plans, which also include Tanzania, Burundi and Rwanda. The planning of the interconnector enables cooperation between the countries and will eventually pave the way for cross-border trade.

Kenya–Tanzania interconnector

A feasibility study for this project, completed in 2002, recommended the construction of a 330 kV single circuit line between Nairobi and Arusha. The interconnector was expected to link the region with the SAPP market through another 330 kV transmission line between Tanzania and Zambia. Dry hydrological conditions resulting in serious power deficits made financiers reluctant to fund the project, which was put on hold.

New developments led to the revival of this project in 2007, and Norway supported a feasibility assessment update that was completed in 2012. The study concluded that a 400 kV double circuit interconnector would be a sound investment. The transmission line is currently under construction with financial support from the African Development Bank and the Japan International Cooperation Agency.

Rusumu Falls Hydroelectric and Multipurpose Development project

Together with the World Bank and Sweden, Norway supports optimization and feasibility studies of the Rusumu Falls Hydroelectric and Multipurpose Development project. Rwanda, Burundi and Tanzania cooperate on this regional project as a joint investment.

Informed by the feasibility environmental and social impact assessments, the participating governments in 2012 decided to pursue the run-of-river option with the least environmental and social impact.

The 80 MW Regional Rusumo Falls project has an investment cost of USD 468 million. The project is currently under construction with financial support from the World Bank and the African Development Bank.

The Mozambique Regional Transmission Development programme

The programme consists of the Mozambique–Malawi interconnector and transmission lines from the Cahora Bassa hydropower plant to Maputo and onwards to South Africa and the regional grid. The transmission lines from Cahora Bassa are important to the region, as they will enable major hydropower investments in the Tete region.

Finalization of the studies is expected in April 2017.

Tanzania–Zambia interconnector

The transmission line will connect the Eastern Africa Power Pool with the Southern African Power Pool. The feasibility study including environmental and social impact assessments, is expected to be finalized in first half of 2017.

FIGURE 6 // REGIONAL INFRASTRUCTURE FEASIBILITY STUDIES SUPPORTED BY NORWAY

Regional Infrastructure Projects

Legend
- Rusumu Falls hydropower plant
- Interconnectors financed by Norway
- Existing Electricity Transmission Network

Project: Rusumo Falls 80 MW hydropower project
Status: Under construction, expected completion in 2018
Supported: Feasibility Study
Year: 2006 – 2007
Implementing partner: NELSAP
Financing support: 10 MNOK

Project: 220 kV Uganda-DRC Interconnector
Status: Planned
Supported: Feasibility Study
Year: 2015
Implementing partner: NELSAP
Financing support: 17 MNOK

Project: 400 kV Kenya-Tanzania Interconnector
Status: Under construction, expected completion in 2017
Supported: Feasibility Study
Year: 2012
Implementing partner: NELSAP
Financing support: 19 MNOK

Project: 400 kV Tanzania-Zambia Interconnector
Status: Planned
Supported: Feasibility Study
Year: 2013 –2017
Implementing partner: NELSAP, Kfw
Financing support: 18 MNOK

Project: 400 kV (initially 220 kV) Malawi-Mozambique Interconnector
Status: Planned
Supported: Feasibility Study
Year: 2014 – 2017
Implementing partner: WORLD BANK
Financing support: 15 MNOK

PREVIOUS VIEW

9 Selected topics

» Promotion of increased access to modern energy has important gender dimensions. Civil Society Organizations are key players in promoting clean energy solutions. Modern cook stoves reduce the workload and exposure to pollution for women and children, and can contribute to ease the pressure on forest resources.

PHOTO: KEN OPPRANN

Civil society

A strong civil society is important to ensure that economic development leads to social development and does not diminish vital ecosystems. This is of particular importance in countries with low confidence in state institutions and few channels for influence. Civil society organizations (CSOs) help to voice public opinions and protect common interests. CSOs often have a high degree of legitimacy in representing the public interest. At their best, civil society actors also engage in constructive dialogue and partnerships with governments and businesses to pursue fruitful solutions together.

Civil society contributes to the establishment of businesses and supply chains around small-scale off-grid solutions for renewable energy. Relevant solutions may include bioenergy, wind, hydropower, solar home systems and clean cookstoves. CSOs often work in areas that lack basic infrastructure such as sanitation, clean water and energy services. This is especially the case in fragile states, and during conflicts and humanitarian crisis. By combining local presence and international networks, civil society can facilitate renewable energy solutions where private sector and state institutions fall short.

In the period 2007-2015, more than 77 500 home systems were provided by civil society actors under the Clean Energy Initiative. This included 60 000 improved cookstoves, 15 000 solar home systems and solar lanterns, 1 500 mud stoves and 700 small biogas digesters. In addition, four large biogas digesters for schools, and a 32 kW biomass gasification plant feeding a mini-grid with 66 customers have been constructed. These projects and programmes often include capacity building, including creation of local maintenance and supply chains that have a profound impact on economic development. The total energy-related support to civil society organizations in the period 2007-2015 was NOK 128 million.

WWF Seize Your Power

With support from Norad, WWF's global campaign, Seize Your Power, helped to influence a total USD 31 billion shift away from coal and into renewable energy by public and private finance actors, USD 8 billion of which was in 2014. WWF advocacy on UNFCCC finance, coordinated globally, helped influence 15 countries[7] to commit USD 8.9 billion in Green Climate Fund pledges. By the end of 2014, WWF reached 80 per cent of its target to shift USD 40 billion away from coal, oil and gas and into renewable energy. The Seize Your Power campaign grew in 2014, influencing financial shifts away from fossil fuels via three project developers[8] and two pension funds[9], as well as into renewable energy via the world's largest sovereign wealth fund[10], 95 cities[11], and one

7 Australia, Belgium, Colombia, Denmark, France, Germany, Japan, Mexico, Netherlands, Norway, Peru, Switzerland, Sweden, the UK and the USA.

8 WWF-Philippines successfully put on hold a targeted coal power development in the island province of Palawan. WWF Italy helped stop a USD 3 billion coal plant development in Porto Tolle, after a dedicated campaign with partners. Norwegian company Statoil shelved a USD 2 billion project in the Canadian tar sands, following WWF Norway's direct shareholder activism campaign at the Annual General Meeting calling on Statoil to end tar sands projects.

9 Sweden's AP2 Pension Fund divested USD 100 million from 20 coal, oil and gas companies, the first for a national fund globally. AP4 committed to portfolio decarbonization.

10 Norway's Government Pension Fund Global increased renewable energy stock investments by approximately USD 0.8 billion and national equity finance for Statkraft rose by USD 1 billion.

11 USD 44 million new renewable energy financing secured from Seoul, Stockholm, Copenhagen, Lappenranta, Edmonton, Cape Town and Coimbatore, and 91 cities in the United States.

national government.[12] WWF and partners formed a regional initiative called Sustainable Energy Access Forum. WWF also released a joint statement with UNDP, Global Village Energy Partnership, Barefoot College and Practical Action calling on governments, the private sector and CSOs to prioritize renewable energy development (WWF's Annual Report to Norad 2014).

China

The environmental NGO WWF works in partnership with companies as part of their Climate Savers Program to set and meet goals to reduce carbon emissions. In China, WWF works with Yingli Green Energy to increase energy efficiency and reduce greenhouse gas emissions directly from their production of solar photovoltaic, but also throughout the products' value chain. In 2014, Yingli Green Energy exceeded its emissions reduction target, two years early. According to figures that have been verified by external consultants, Yingli reduced its emissions between 2010 and 2013 by 390 000 tonnes of CO_2 equivalent.

Togo

Friends of the earth (Naturvernforbundet) reports that its partner JVE provided equipment to three small stove businesses in order to increase their market coverage in Togo. One of the stove factories was able to secure new contracts and strengthen its staff in both production and administration. Naturvernforbundet reports the sale of 20 000 units of improved cook stoves in this programme supported by Norad.

12 Philippines Department of Energy committed to raise solar PV investments by USD 0.9 billion in the next two years.

Gender

Women's rights and gender equality has long been a priority in Norwegian development policy. The aims are to ensure equal opportunity, fulfil women's basic and universal human rights, and to provide women with the same opportunities as men to participate economically, politically and socially in all parts of society.

Energy poverty has marked gender characteristics. Women and girls have the primary responsibility for collecting fuel for their families in many societies. This drudgery prevents participation in other educational and income-generating activities, and takes a significant toll on women's and girls' health and well-being. Indoor pollution from biomass use is a serious health problem in particular for women and children under the age of five. Women are often excluded from discussions and decision-making about energy plans and policies.

In view of this, gender has been an explicit focus for the Clean Energy Initiative. To actively promote gender mainstreaming in its programme portfolio, Norad entered into a framework agreement with the International Network of Experts on Gender and Energy (ENERGIA). Members of the ENERGIA network covers a wide range of gender analysis and mainstreaming skills in relation to the energy sector in most of the core countries under the Clean Energy Initiative.

EXAMPLES OF GENDER INTERVENTIONS RELATED TO CLEAN ENERGY:

Tanzania
Norway has supported a project to educate and recruit more women engineers in Tanzania. Since 2010 the number of female engineers has more than doubled.

Nepal
Mainstreaming of gender equality into an overarching energy programme has helped women access electricity, freed up time, and enabled 12 000 women to engage in income-generating activities. The women participate actively in the planning and carrying out small-scale energy projects. Earmarked subsidies and the use of quotas to include women in training programmes on how to start up small businesses have contributed to the results.

Ethiopia
Support has been given to the Women's Affairs Directorate in the Ministry of Water, Irrigation and Energy to mainstream gender equality in the operationalization of the Climate Resilient Green Economy strategy.The aim is to ensure that gender issues will be systematically addressed throughout the energy sector through a Gender Action Plan.

Key interventions in the period 2014-2015 include:

- Skills and knowledge gap assessments of energy sectors were conducted in Amhara, Somalia and Oromia regions of Ethiopia

- Training of trainers for different directorates and regional energy bureaus on gender mainstreaming, concepts, analysis, planning, monitoring and evaluation indicators, lobbying and advocacy and reporting. A national level training manual was prepared.

Mozambique
A new agreement for the bilateral energy cooperation programme for the period 2012–2017 includes guidance on practical gender mainstreaming. The agreement commits senior energy sector decision makers to advance gender equality.

Key interventions:

- The Ministry of Energy has produced a gender strategy and the public energy and oil institutions and companies have developed gender action plans.

- Practical action programmes to support women in their daily lives and introduce them to electricity. These include productive use of electricity in small private businesses, making and selling improved cook stoves and establishing a pilot communal gas kitchen.

Quotas and earmarked subsidies increase women's participation in Nepal
In Nepal, mainstreaming gender equality has helped women to access electricity, free up time and 12 000 women to engage in income-generating activities. The women participate actively in the planning and carrying out of small-scale energy projects. Earmarked subsidies and the use of quotas to include women in training programmes on how to start up small businesses have contributed to the results.

Dr. Patricia Lotho, Uganda Rural Energy Agency. PHOTO: KEN OPPRANN

The energy sector in Nepal has long been dominated by men, and is criticized for not respecting needs of customers for access to and use of energy. Research show that women have traditionally had no influence on decisions concerning access to the grid, or what the electricity is used for. Despite women's role

in and responsibility for food preparation, they seldom have any influence over the type of cooking stove that is purchased for the household. Access to electricity can be used to start income-generating activities, and create more jobs. However, experience from other countries show that without specific training or access to capital, income-generating activities are not automatic results of access to electricity.

The National Rural and Renewable Energy Programme (NRREP), established in 2012, aims to raise the standard of living, create jobs and boost the productivity of rural Nepal by facilitating access to clean energy. Programme activities aim to augment the quality of and access to clean energy, providing training and information to ensure the use of energy for income-generating activities. The programme has established a fund for more effective distribution of subsidies for energy projects in rural areas. Quotas, earmarked subsidies and access to loans were used to ensure that women were sufficiently involved in the programme.

The Alternative Energy Promotion Center in Nepal has been involved in social mobilization and coordination with local authorities and human rights organizations. So far, over 900 000 households totalling 5 million people, (2.6 million women), have benefited from the programme.

The total budget for the programme is USD 184 million for the period 2012–2017, of which 40 per cent is to be funded by the Government of Nepal. The remaining 60 per cent is to be funded by multiple donors with grant financing. The Norwegian share of the budget amounts to NOK 172 million over a five-year period, or 26 per cent of the donor-funded share of the budget.

Improved cookstoves

Every day, almost half of the world's population prepares food, boils water, and heat their homes by burning wood, other types of solid biomass or coal on open fires or simple cook stoves. This has serious consequences for deforestation and greenhouse gas emissions, and solid-fuel cooking imposes significant costs on poor households. In addition, it has adverse health effects for those who are cooking, and others who are exposed to air pollution.

Today, air pollution from cook stoves kills more people than AIDS, malaria and tuberculosis combined. But unlike AIDS, where the death toll drops every year thanks to global initiatives, the death toll linked to indoor air pollution is increasing due to population growth and lack of strengthened investment in the sector.

» **3 billion people** use polluting, inefficient stoves to cook their food each day.

» **4.3 million people** in the world die each year from exposure to cookstove smoke, and millions more fall ill.

» **WHO estimates** that indoor air pollution is the most serious health risk in the world today.

It is a Norwegian priority to contribute to the use of more efficient cookstoves. This is important from a gender equality, health and environmental perspective. Clean cookstoves improve the indoor climate, which is of particular benefit for women's and children's health. They also reduce deforestation, the collection times and purchase costs of firewood.

Norwegian support to cleaner cooking solutions is directed through the health, energy and forestry sectors, through education and awareness raising, and through several civil society organizations.

A number of initiatives and organizations work to promote clean cookstoves, and Norway has supported both international and local NGOs involved in these efforts. Their work ranges from distribution of cleaner cook-stoves, through policy work, to capacity building and information. International civil society organizations such as Friends of the Earth (in Nigeria, Togo and Mozambique), WWF (Champion District Initiative in Uganda) and ENERGIA have received support to implement clean cooking programmes on a national level. In addition, Norway has supported local actors and programmes such as Tanzania Traditional Energy Development Organization in Tanzania (TATEDO), the Rural Energy Agency in Tanzania, National Rural and Renewable Energy Programme (NRREP) in Nepal, and the regional Programme for Biomass Energy and Conservation (ProBEC) in Southern Africa.

Access to clean cooking is also central to the Sustainable Energy for All (SE4ALL) initiative, Climate and Clean Air Coalition (CCAC) and is key to the Energizing Development (EnDev) partnership in which Norway is a leading donor. Norway was one of the founding partners of the Global Alliance for Clean Cookstoves in 2010, with an aim to ensure that 100 million homes adopt clean and efficient stoves and fuels by 2020.

Clean and efficient cookstoves and fuels support 10 of the Sustainable Development Goals. In 2014 Norway pledged USD 40 million to secure cleaner cooking in developing countries for the period 2014 to 2017, with the aim of achieving multiple benefits on health, climate change, poverty, energy access and the security of women and children. The Norwegian support will target (i) particle-free cook stoves in urban households, (ii) making clean, particle-free stoves available in refugee camps, and (iii) continuing to support programmes on more efficient, cleaner stoves in rural areas. Other important elements of the Norwegian support will be awareness raising, capacity building and development of standards and guidelines regarding types of stoves, emissions levels and air quality.

The Programme for Biomass Energy and Conservation (ProBEC)

ProBEC is an official Southern African Development Community (SADC) regional energy programme and the only one dealing with traditional energy. More than 80 per cent of people in the SADC region will continue to use biomass such as wood (charcoal), agricultural and forestry residues as an energy source, especially for cooking, in the near future. Biomass energy is,

however, currently not used efficiently, which leads to the acceleration of deforestation, land degradation and desertification.

ProBEC was implemented with technical support from Germany in the period 1998 – 2011. Norway supported the third implementation phase 2007-2010 with NOK 25 million. Almost 230 000 energy-efficient stoves were sold and thus about 1.2 million people supplied with modern cooking energy. The programme has established positive and widely accepted approaches for the efficient use of bioenergy in the region.

Woman cooking on a clean cookstove. PHOTO: GACC

10 Methodology

» The presentation and aggregation of results in this report is based on assumptions and methodology explained in this chapter.

PHOTO: JAN SPEED

AGGREGATING RESULTS

This report aims to present aggregated quantifiable results and key findings from Norway's energy assistance in the period 2007 – 2015. Contributions came from the Norwegian Ministry of Foreign Affairs (including embassies), Norfund, Norad and other partners. The report primarily presents results at the output level, and to some extent at outcome level[13].

Quantifiable aggregated results are based on the following assumptions:

- Bilateral support: 100% of the reported results are included because Norway is usually a significant donor to bilateral programmes and actively involved in their design, implementation and follow-up.
- Multilateral support: 1% of reported results are included because Norway contributes in the order of 1% to most of the multilateral organizations[14] that have provided inputs to this report.
- Commercial channels: 100% of the reported results are included because Norway's contribution tends to be more substantial, and the contribution is both financial as well as advisory. This is the same approach as other partners account for results.
- EnDev and Clinton Climate Initiative's diesel replacement programme: 10% and 100% respectively of the reported results are included[15] , corresponding to Norway's financial contribution to the programme budget.
- The estimate that 6 000 MW of generation capacity cover the annual consumption of 30 million people, is inferred from the planned energy production from these installation and the average consumption of households in the countries in question.

Aggregating quantifiable results presented several challenges. One challenge is related to quantifying Norway's attribution[16] to the results of multi-donor programmes and organizations. Another is the risk of double-counting[17] as several partners can have contributed to and accounted for the same result.

Aggregating is further complicated by the fact that different programmes can have different targets, different requirements and methodologies for results reporting. Some may focus on grid-connecting households. Others may focus

13 In development terminology, results refer to achievements on different levels. The planned main products and/or services of a programme are referred to as 'outputs'. The number of household connections achieved, length of electricity lines constructed and new installed generation capacity are typical examples of outputs. The next level, the planned effects for the target group, is referred to as 'outcomes'. Productive use of energy for income generating activities, greenhouse gas mitigation, and improved power utility performance are typical examples of outcomes from energy programmes. Above the outcome level, is 'impact', i.e. the planned longer-term effects on society, for example economic growth, reduced poverty and improved welfare for the population at large.

14 These organizations are not listed and shares are not distributed.

15 We have the similar insights in the work and results reporting of these two partners as for bilateral projects managed by embassies.

16 In some cases, Norway's support, for instance funding of a hydropower feasibility study, may have contributed to that this particular project was selected rather than other projects, or that a particular project was advanced with more years. In some cases, Norway's financial contribution, may have contributed to financial close that otherwise might not have been achieved, while in other cases Norway's financial contribution may have increased the project scope.

17 Some programmes are realized due to support from both a multilateral bank and bilateral support, both of which receive support from Norway.

on connecting schools and health clinics. Some consider kilowatt hours to be a better indicator than installed capacity. This report provides aggregated results on increased access to households across different channels and programmes. Actual achievements in some programmes are, however, likely to be higher than reported.

Some interventions, in particular support to capacity building, while crucial to the development of the sector, have results that are difficult to measure. Thus, several programs within capacity building and institutional development present results through narratives rather than numbers.

It should be noted that in some cases we have not been able to verify whether reported results also are due to support before 2007. On the other hand, many of the supported projects in this period will only yield results after 2015.

The report makes a distinction between actual and expected results. Many energy projects have a long lead-time between disbursements and results. Expected results mainly refer to projects in good progress, for example infrastructure projects where financial close is secured and/or construction works are ongoing. Planned results from projects at an early stage are not reported. Thus, it is important to have in mind that expected results do not refer to the project pipeline for a particular partner or embassy.

INTERPRETING RESULTS

Comparing programmes and channels of support to one another is a major challenge. For example, comparing results from support through bilateral programmes and multilateral organizations is difficult due to the differences in type of programmes, geographic scope, political context. Partners may not apply the same monitoring and evaluation methodology. One example is life-time of energy technologies. Some energy technologies (as mud cook stoves) may have a lifetime of only two to three years. While for instance a partner organization such as EnDev takes this into account, other partners may not.

Furthermore, not all results are clearly positive or negative. For example, support is sometimes given to commercial investors to develop hydropower (pre-) feasibility studies. These studies support the investor to make an informed investment decision, which is positive. However, some may consider the result as positive only if the investor decides to build the hydropower plant.

DISCLAIMER

The report is not an independent assessment or evaluation. It is an effort to collate results from support provided to energy programmes in the period between 2007 and 2015 based on input provided from various partners and sources. The information received has not been verified through an independent verification process. Simplifications may have come at the cost of accuracy. However, for many projects detailed assessments are also available.

Acronyms and abbreviations

AIHRC	Afghan Independent Human Rights Commission
ADB	Asian Development Bank
AEPC	Alternative Energy Promotion Centre (Nepal)
AfDB	African Development Bank
ATC	Arusha Technical College (Tanzania)
BMZ	Federal Ministry for Economic Cooperation and Development
BTI	Butwal Technical Institute
CCGT	Combined cycle gas turbine
CCI	Clinton Climate Initiative
CDM	Clean Development Initiative
CEFPF	The Clean Energy Financing Partnership Facility
CIF	Climate Investment Fund
CSOs	Civil society organizations
COP	Conference of the Parties
CO2e	Carbon Dioxide equivalents
CTF	Climate Trust Fund
DAC	Development Assistance Committee
DAM	day-ahead market
DoED	Department of Electricity Development (Nepal)
EAPP	Eastern Africa Power Pool
EdM	Electricidade de Moçambique (Mozambique)
EE TTF	UNDP Thematic Trust Fund for Energy and Environment
EIB	European Investment Bank
EnDev	Energising Development
ENERGIA	International Network of Experts on Gender and Energy
Energy+	The International Energy and Climate Initiative
EnPe	Energy and Petroleum Master Programme
ESAP	Energy Sector Assistance Programme (Nepal)
ESMAP	Energy Sector Management Assistance Programme
EUR	Euro
EVN	Electricity of Vietnam
EWURA	Electricity and Water Utility Regulatory Authority (Tanzania)
FAO	United Nations Food and Agriculture Organisation
GACC	Global Alliance on Clean Cookstoves
GEEREF	Global Energy Efficiency and Renewable Energy Fund
GEF	Global Environmental Facility
GET FiT	Global Energy Transfer Feed-in Tariffs (Uganda)
GW	Gigawatt
GWh	Gigawatt hours
GLOBMEK	Globalisation of environment, energy and climate research
IBRD	International Bank for Reconstruction and Development
ICH	International Centre for Hydropower
IDA	International Development Association
IEA	International Energy Agency
IFC	International Finance Cooperation
IRENA	International Renewable Energy Agency
KfW	Kreditanstalt für Wiederaufbau (German development banking group)
LEC	Liberia Electricity Company
MOEE	Ministry of Electric Energy (Myanmar)
MLME	Ministry of Lands, Mines and Energy (Liberia)
MW	Megawatt
NDF	Nordic Development Fund
NEA	Nepal Electricity Authority

NEDCO	Northern Electricity Distribution Company (Palestine)
NHP	National Hydropower Study (Vietnam)
NMBU	Norwegian University of Life Sciences
NOMA	Norad's Programme for Master Studies
NOK	Norwegian Kroner
NORGLOBAL	"Norway – Global Partner" (research programme)
NRREP	National Rural Renewable Energy Programme (Nepal)
NTNU	Norwegian University of Science and Technology
NUFU	Norwegian Programme for Development, Research and Education
NVE	Norwegian Water Resources and Energy Directorate
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development's
REA	Rural Electrification/Energy Agency
REB	Renewable Energy Business incubator (Uganda)
REF	Rural Electrification/Energy Fund
REPP	Renewable Energy Performance Platform
RISE	Readiness for Investment in Sustainable Energy (ESMAP)
ProBEC	The Programme for Biomass for Energy and Conservation
PV	Photovoltaics
SADC	Southern African Development Community
SAPP	Southern Africa Power Pool
SASEC	South Asia Sub-Regional Economic Power System Expansion Project
SELF	Solar Electric Light Fund
SE4All	Sustainable Energy for All
SDG	Sustainable Development Goal for Energy (SDG7)
SREP	Scaling-up Renewable Energy Programme
TaTEDO	Tanzania Traditional Energy Development Organization
TERI	The Energy and Resources Institute (India)
TSO	Transmission System Operator
UCT	University of Cape Town (South Africa)
UNEP	United Nations Environment Program
UETCL	Uganda Electricity Transmission Company Limited
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention for Climate Change
USD	United States Dollar
WB	World Bank
WBG	World Bank Group
WEO	World Energy Outlook (IEA publication)
WHO	World Health Organization
WRC	Water Resources Commission
WWF	World Wildlife Fund
ZECO	Zanzibar Electricity Company

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March 2017
Photo: DAWNUS INTERNATIONAL (cover)
ISBN: 978-82-7548-930-0