

# GIZ PORTFOLIO: RENEWABLE ENERGY AND HYBRID MINI-GRID SYSTEMS



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# FOREWORD

Dear Reader,

Electricity is vitally important to humanity. Alongside the provision of important services like lighting, cooling and communication, it enables education, productivity and health care. According to the International Energy Agency (IEA), an estimated 1.2 billion people worldwide lack access to electricity for their daily needs and in some parts of the world this number is increasing. In Africa's sub-Saharan countries, the national electricity grids rarely serve more than 30% of the population. Even in countries that have been able to allocate funds for rural electrification, significant parts of the population still lack access to electricity.

At the international level, the UN has adopted 17 Sustainable Development Goals. Goal number seven is on affordable and clean energy and has the target of ensuring access to affordable, reliable and modern energy services for all by 2030. With regard to electricity, achieving this universal access will require extending national grids and deploying decentralised solutions like mini-grids and stand-alone systems. Evaluations show that mini-grids in particular offer a cost-effective way to deliver more than a third of the new electricity connections required. That said, deploying mini-grids as a means of opening up access to electricity and as part of the wider development of the electricity sector is a challenging undertaking that requires commitment, dedicated resources and specific expertise.

For more than four decades, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH has worked with the governments of more than 40 countries in Africa, Asia and Latin America on providing access to electricity in their rural areas. When developing mini-grids, GIZ works in a practical, outcome-oriented way at the global, regional, national and local levels. It also provides technical assistance to regional organisations and governments of partner countries, as well as hands-on support to local institutions, communities and the private sector.

The primary focus of our work on mini-grids is to help partner governments enhance their policy and regulatory frameworks and strengthen the capacities of their public and private sectors for the planning, implementation and operation of these grids. Our solutions seek to leverage public and private investments for piloting and facilitating the scaling up of sustainable business models that improve the livelihoods of local communities. The effectiveness of our actions is increased through the transfer of experiences and best practices across borders and between cultures. GIZ is constantly working on innovative and tailor-made solutions to support partner countries with their ambitious strategies and policies for broadening access to electricity. The following pages outline our expertise and the advisory services we provide.

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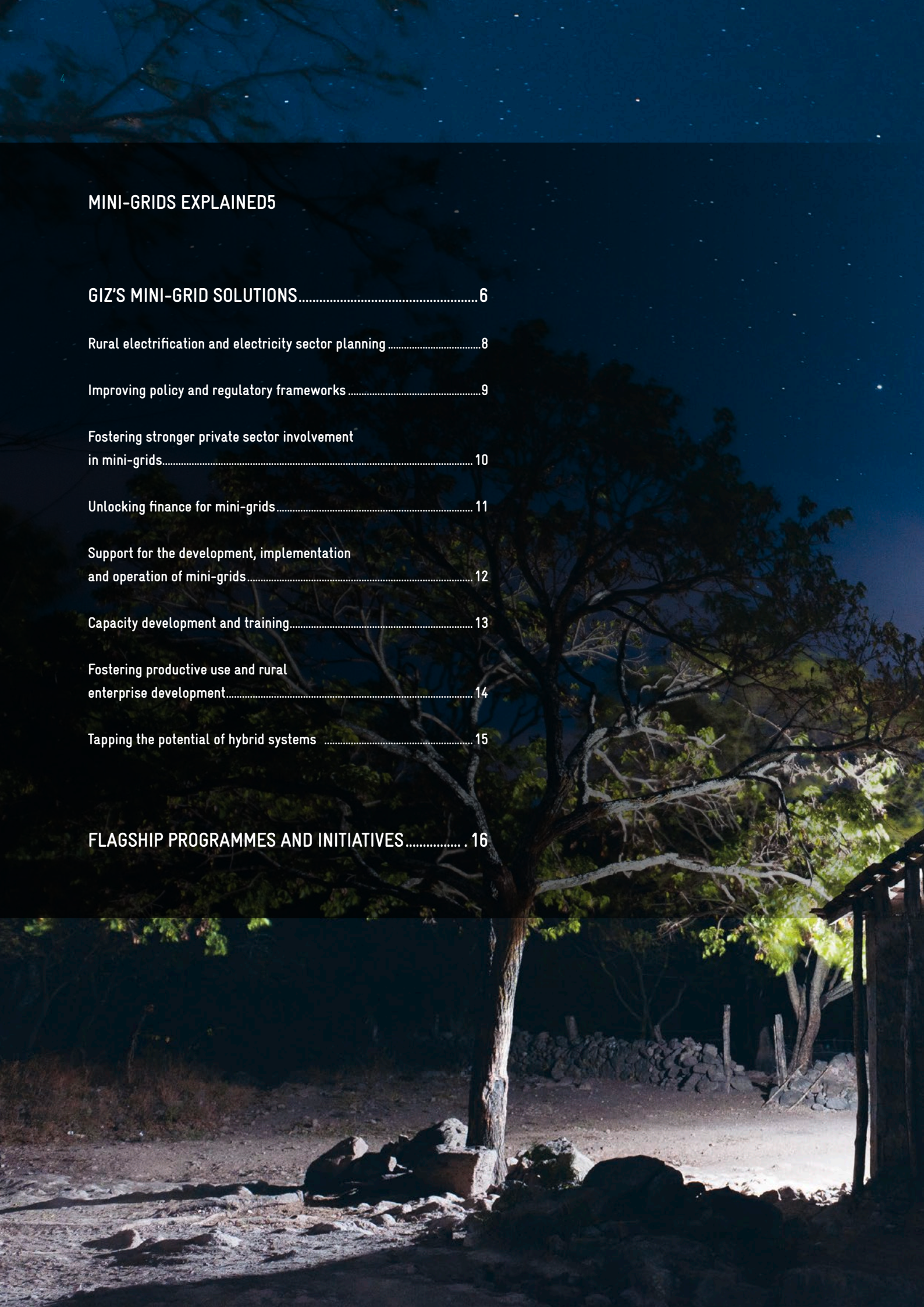
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## MINI-GRIDS EXPLAINED

Mini-grids are, along with grid extensions and stand-alone systems, one of the key modalities for enhancing access to electricity in rural areas. Mini-grids are electricity systems that combine electricity generation and distribution at the small-scale (usually below 10 MW). They serve the needs of communities large or small, offering higher levels of service than solar home systems and enabling the productive use of energy in addition to providing basic services like lighting and mobile phone charging. The energy sources used to generate electricity in a mini-grid can be renewable (hydro, solar, biomass, wind) or non-renewable (diesel, heavy fuel oil). While the majority of mini-grids are set up to provide AC electricity and to power standard

consumer products and appliances, in some remote rural areas with low power demand, DC mini-grids have been introduced. Mini-grids can also be interconnected with national electricity grids to provide more power to customers and, at the same time, increase the reliability and availability of electricity supply on either side of the interconnection point. Multiple mini-grids can be interconnected to form a wider distribution network, which offers the opportunity to gradually extend coverage. In terms of customer benefits, mini-grid systems can be equipped with intelligent metering and payment systems that enable flexibility in energy usage, demand-side management, and efficient (and informative) revenue collection.





# GIZ'S MINI-GRID SOLUTIONS



## RURAL ELECTRIFICATION AND ELECTRICITY SECTOR PLANNING

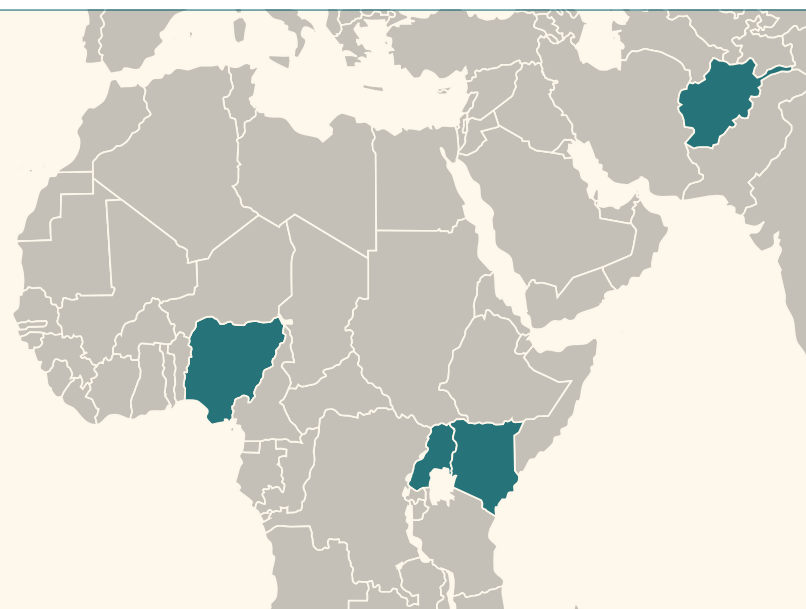
Multiple and often conflicting demands drive rural electrification and electricity sector planning. A balance between these diverse interests can only be achieved if planning and management recognise all stakeholders' economic, environmental, political and social concerns. Integrating mini-grids into rural electrification and wider electricity sector planning can help to accelerate the provision of energy access, maximise the use of local renewable energy resources and lay the foundations for developing forward-looking electricity sector management. Leaving mini-grids out of sector plans makes it extremely difficult for projects to be implemented as top-level guidance is lacking. Additionally, mini-grids can potentially lower the costs of rural electrification, enhance community ownership and increase security of supply for large and diverse groups of customers. Mini-grids can also promote the productive use of energy and create income-generating activities and employment, and thus can spur local economic development. Mini-grids, which use locally available energy resources, offer a more resilient energy supply when there are disturbances in the main grid. GIZ supports energy sector and rural electrification planning and promotes mini-grids as part of this planning.

It also works with its partners to establish geographic information system (GIS) databases that help them to manage and organise the geospatial data required for rural electrification and energy sector planning and policy implementation. These databases make it easier to develop electrification plans that are based on least-cost economic criteria and that reflect the aspirations and willingness to pay of customers and other stakeholders in the area of supply. GIZ helps to develop and introduce technology and site assessment methods and tools, and it facilitates the necessary capacity development with government partners. A key aspect of GIZ's work is the identification, assessment and piloting of viable ownership and operation models that enhance community ownership and encourage private sector participation, with an appropriate balance between public and private participation in the overall ownership, operation and regulation of electricity service provision from mini-grids. Another focus of GIZ interventions is on ensuring that quality products and infrastructure are installed and maintained. GIZ also provides support on change management in institutions and the development of institutional strategies to deliver energy access with the most optimal solutions.

In *Afghanistan* GIZ supported the development of a sector policy and strategy for rural renewable energy, and the production of provincial electrification plans. It also helped to set up a unit within the national utility that is tasked with planning, implementing and managing decentralised electrification projects.

In *Uganda* GIZ coordinated the establishment of a GIS working group comprised of representatives from relevant ministries. It also helped to collect and publish information relevant to the planning of rural electrification. Uganda's Rural Electrification Agency uses this and other data to support the development of electrification master plans, which inform the government about the most appropriate option – mini-grid or grid extension – to employ when electrifying specific villages.

In *Kenya* GIZ has developed a series of handbooks on mini-grid site-selection criteria, planning and design, licensing, and financing that provides policy-makers, project developers and investors with guidance on the planning process for installing mini-grids in the country.



In *Nigeria* GIZ works at the federal and state levels to develop data management systems and least-cost electrification plans with a focus on rural off-grid areas. By late 2016, nearly 4,000 sites with a potential customer base of twelve million people had been identified as suitable for the installation of mini-grids.



## IMPROVING POLICY AND REGULATORY FRAMEWORKS

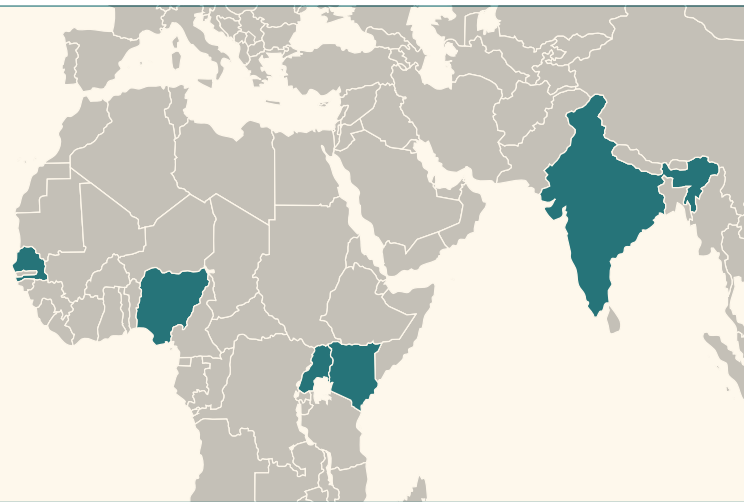
Policies and regulations that clearly define the rules applying to rural electrification and small-scale renewable energy projects are extremely important. Without them, local communities and the private sector will struggle to make appropriate investment decisions or deploy resources. An adequate policy and regulatory framework helps to define the roles of electricity actors, enable different business and operational models, and encourage private sector involvement in the implementation of rural electrification projects. Policy-makers and regulators can heavily influence the deployment of mini-grids by establishing rules on the licensing of mini-grid developers and operators, technical standards, performance indicators and reporting requirements, the levels of electricity tariffs charged by mini-grid operators, and the financial and technical arrangements to be employed when the main grid comes within reach of a mini-grid. Promotion instruments for mini-grids can also create incentives for investment, enable entrepreneurial spirit and contribute to improving the delivery of public services.

GIZ has been involved in the development of mini-grid policy and regulatory frameworks in several countries and has assisted the design and introduction of various promotion instruments. This has been achieved by working together with line ministries and regulators to analyse policy and regulatory gaps, draft policy documents and legislation, carry out sector reviews, and evaluate policy and regulatory effectiveness. The development of tools for regulatory decision-making, public procurement and the technical and financial appraisal of mini-grids are central elements of GIZ's support to public institutions. GIZ supports public sector actors in carrying out tariff reviews and tariff setting, performance evaluations and reporting, monitoring, and the adaptation of regulatory best practices from other countries to local conditions. GIZ also provides advice on the adoption of international technical standards and the formulation of implementation guidelines to ensure that systems are high-quality and operate reliably.

In *Senegal* GIZ worked with the country's rural electrification agency to develop and implement a concession scheme for mini-grids. Through this scheme, licensed mini-grid operators are permitted to distribute and sell electricity to village customers for a period of 15 years and at tariffs approved by the regulator.

In *Uganda* GIZ is developing a procedure for public agencies that enables them to invite private companies to tender for clusters of mini-grid projects. The scheme will help to ensure more effective subsidy disbursement and economies of scale during project development and execution. Furthermore, working with the Ugandan regulator, GIZ has developed a set of simplified and standardised licence application templates for mini-grids.

In *Kenya* GIZ has developed regulatory tools for mini-grids operating under a concessionary energy retail model. The tools address the legal and economic issues around the integration of mini-grids in situations where connection with the main grid becomes possible. GIZ further assisted the regulator in developing a comprehensive guide on the process of licensing mini-grids, which provides the private sector with guidance on obtaining permits and licences.



In *Nigeria* GIZ supported the regulator on its preparation of a comprehensive regulation for mini-grids. Among other things, this regulation contains a tariff calculation tool, which includes the option to formulate reflective tariffs, and a mechanism for compensating mini-grid operators in cases where the main grid reaches their area.

In *India* GIZ provided technical inputs to the Government of Uttar Pradesh to support its drafting of a policy on mini-grids. The policy was adopted in 2016.

## FOSTERING STRONGER PRIVATE SECTOR INVOLVEMENT IN MINI-GRIDS

While the large majority of renewable energy mini-grids in operation today have been developed by rural electrification agencies, public utilities, charities and development organisations, the introduction of innovative business models and technologies is making private sector participation in mini-grids viable under certain conditions. A number of private companies have shifted their business models from cash sales of products and system installations to mini-grid development and operation, and the provision of electricity supply services.

The capacities and responsibilities that are required in mini-grid companies are extremely diverse and can include anything from searching for and selecting a site, designing systems, selecting equipment and maintaining assets, through collecting payments and sourcing financing for expansion, to developing customer relationship strategies for conflict resolution and compensation in cases of power outage. The list is endless, and only a handful of companies have demonstrated that they have the skills, expertise and passion needed to establish viable business models for the overall ownership, operation and management of mini-grids

for non-electrified customers. Public support is still largely necessary for closing viability gaps, facilitating access to capital, preparing projects, incubating business models, strengthening capacity and piloting innovations.

In several partner countries, GIZ has put interdisciplinary teams in place that provide entrepreneurs willing to venture into mini-grid development and operation with the technical assistance they require. Establishing linkages with relevant local stakeholders, assisting in identifying sources of finance, providing sector information and helping to navigate the often complex regulatory and institutional environment are key elements of GIZ's support to the private sector. GIZ works to reduce developers' costs by carrying out research, developing and providing information, and making materials, methods and tools available as open-source resources. Partnerships with relevant actors are established in order to make instruments available for mitigating or eliminating individual risks. Finally, GIZ works with private sector associations and facilitates public-private dialogue with a view to developing a common vision for the sector and finding solutions for any challenges that may arise.

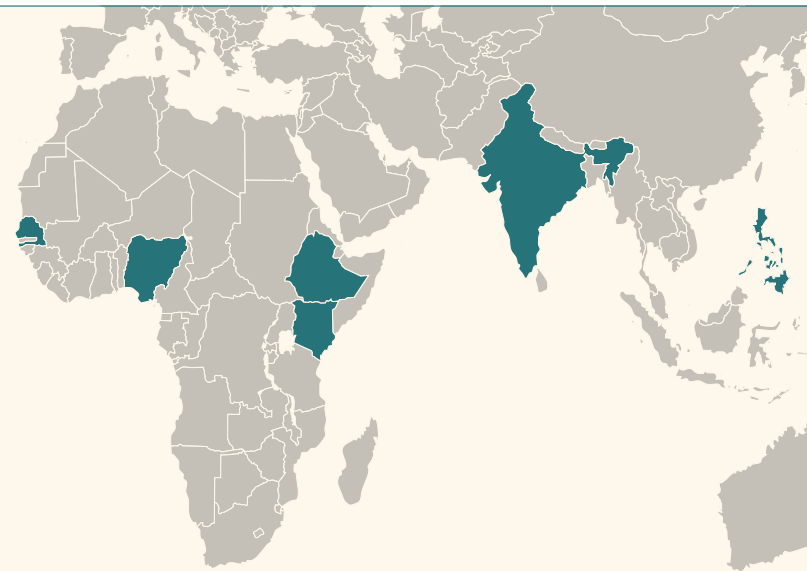
In *Senegal* GIZ helped with the analysis of potential mini-grid sites and provided companies with support on system design and grid planning.

In the *Philippines* GIZ developed an investor checklist for the project developers of hybrid systems that provides guidance on preparing financing proposals and business plans and helps them in their negotiations with banks.

In *Ethiopia* GIZ developed a practical guide for hydro-power mini-grids.

Drawing on experiences gained when planning a pilot plant, GIZ in *Kenya* developed an online tool ([www.minigridbuilder.com](http://www.minigridbuilder.com)) and the 'What size shall it be?' manual to provide private companies and other stakeholders with guidance on how to properly size mini-grids and thus ensure better returns.

In *Nigeria* GIZ has established public-private partnerships with four local companies for mini-grid development. As part of its contribution to the partnership, GIZ provides technical assistance across the whole mini-grid project development cycle.



In *India* GIZ worked with the State Government of Uttar Pradesh on developing a private sector implementation model for mini-grids that sought to secure the large-scale participation of private companies. GIZ India also supported private developers by conducting demand assessments in 100 unelectrified and de-electrified villages to serve as a basis for establishing solar mini-grid pilot projects.

## UNLOCKING FINANCE FOR MINI-GRIDS

In many countries, two major barriers to mini-grid development are lack of access to finance and chronic underinvestment in infrastructure in rural areas due to real or perceived risks. Mobilising funding for rural electrification and improving the management of public funds that go towards electrifying rural areas is indispensable if universal access to electricity is to be realised. Possible avenues for allocating public finance to mini-grids include making mini-grid projects eligible for funding from rural electrification funds, integrating them into existing subsidy schemes, and establishing dedicated public funds. Private capital can also be unlocked through the introduction of de-risking instruments, credit enhancement and financial incentives for developers. The provision of technical assistance to the financial institutions involved in appraising mini-grid projects can also have a strong positive impact on how financiers assess and price the risks of such projects. Targeted awareness-raising among non-traditional investors in rural electrification, such as philanthropic foundations or pension funds, has the potential to secure additional resources for mini-grid development.

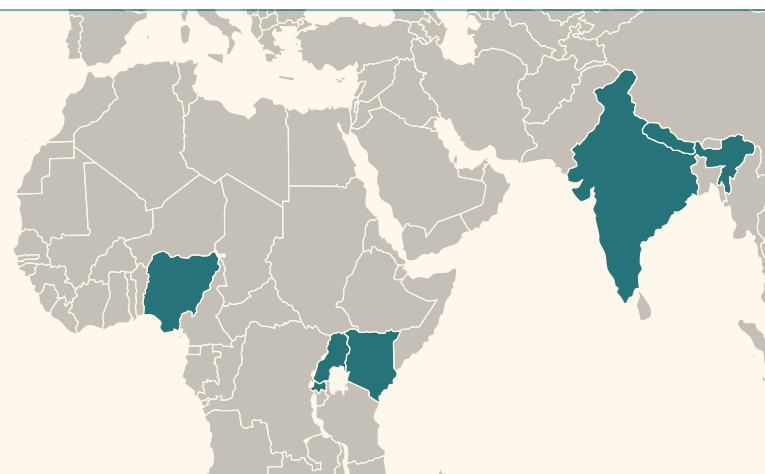
GIZ is advising decision-makers on risk mitigation and on how to optimise public spending for mini-grids and leverage contributions and cofinancing from the private sector and users. GIZ helps financial institutions and public funders to better understand mini-grid projects and assists in the design and implementation of investment instruments. In cases where financiers show no interest in mini-grids, GIZ can put seed financing instruments in place to demonstrate that mini-grids are viable investments. To improve mini-grid projects' chances of obtaining finance, GIZ works with project developers on enhancing their financial know-how. Public-private dialogues facilitated by GIZ help stakeholders to understand each other's needs and identify financing solutions that can accelerate investments. GIZ informs sector stakeholders about the risks and challenges involved in mini-grid projects and helps establish mitigation instruments to address these risks.

In *Nepal*, where publicly funded hydropower-based mini-grids have a long history, GIZ seeded the establishment of a Micro Hydropower Debt Fund, which leverages the capital of two local commercial banks. The fund has been very successful at providing debt finance to projects and has attracted additional funding from other donors.

In *India* GIZ helped assess barriers to the financing of mini-grid projects and is working with investors to develop financing instruments.

In *Rwanda* and *Kenya* GIZ on behalf of DFID established results-based financing schemes that incentivise entrepreneurs to invest in mini-grids. These schemes are implemented through local financial institutions as a way of building these institutions' capacities.

In *Nigeria* GIZ, working together with USAID, advises local banks on mini-grid financing. A public-private partnership with a crowdfunding platform has also been established to pioneer international (crowd) debt financing for mini-grid projects in the country. Debt will be matched with public subsidies and equity from local investors.



In *Kenya* GIZ has developed a handbook on mini-grid economics and financing, which discusses the cost structures and risks of mini-grids, the demand among project developers for different kinds of finance, and the requirements of finance institutions.

In *Uganda* a financial model for mini-grids has been developed that enables GIZ to support the regulator and developers in their work to forecast operational revenues, calculate necessary subsidies and lobby for cost-reflective tariffs to instil investor confidence.

## SUPPORT FOR THE DEVELOPMENT, IMPLEMENTATION AND OPERATION OF MINI-GRIDS

Planning and implementing mini-grids that, once commissioned, will continue to operate for many years is a challenging task. Sound technical design, a high level of ownership by local stakeholders, ongoing government support, high-quality components, committed management and flexibility are just some of the areas that require specific expertise and resources. When designing mini-grid systems it is important to consider aspects such as customers' ability and willingness to pay, energy-demand dynamics and like renewable energy resources, among others. Mini-grid systems that lack appropriate administrative, financial or customer management will not be successful. Consultations with local leaders and potential customers are therefore needed to determine the levels of interest and to obtain advice and input on the design of systems.

GIZ works with utilities, communities and private companies to plan, finance and install renewable energy mini-grids. It ensures that effective and inclusive consultations

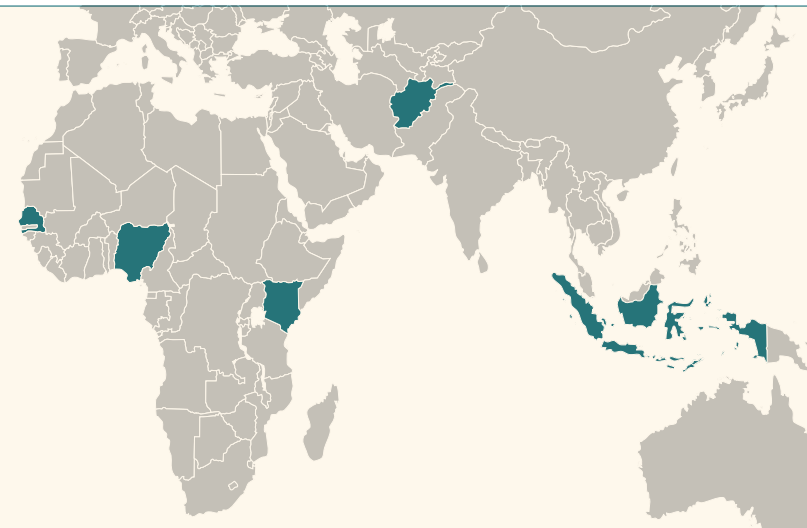
take place at all stages of a project cycle for the successful implementation of renewable energy mini-grid projects. GIZ facilitates local authority involvement with the aim of securing political commitment and promoting high levels of interaction between investors and communities. By involving communities in the planning and operation of mini-grids, projects become better integrated and adapted to local needs. This can mean the difference between a community productively using the electricity generated and paying the often higher tariffs, and a project going bankrupt due to customer dissatisfaction, which sometimes prompts the community in question to apply political pressure for the installation of a national grid connection. GIZ fosters innovation by helping operators to manage assets effectively, define acceptable tariff systems and payment modalities, and introduce demand-side management measures. Electricity customers receive support on establishing electricity user cooperatives, conflict resolution mechanisms and efficient fee collection.

In *Afghanistan* GIZ supported the implementation of mini-grids, from project design through construction oversight to commissioning, and is overseeing their operation.

In *Indonesia* GIZ set up a knowledge-sharing platform for mini-grid operators and carried out technical inspections to determine the quality of installations and their operational performance. Based on the findings of the technical inspections and monitoring, GIZ developed publicly available templates and questionnaires on key performance indicators, and worked with the government to improve the technical specifications included in its tender documents.

As part of a public-private partnership in *Senegal*, GIZ helped to pioneer smart metering.

In *Kenya* GIZ worked with county governments on piloting a hybrid photovoltaic and diesel mini-grid project, oversaw the engagement of a private sector company in mini-grid operation and maintenance, and facilitated the adoption of a mobile money payment system that enables customers to purchase prepaid electricity tokens. GIZ also provided Kenya's Rural Electrification Authority with further support on developing technical specifications for the construction of solar hybrid mini-grids.



In *Nigeria* GIZ worked with the federal- and state-level governments on establishing a framework for public-private partnerships that enables the two sectors to jointly develop and implement mini-grid projects. In future the private sector will be able to operate and maintain mini-grids with oversight from the public authorities.

## CAPACITY DEVELOPMENT AND TRAINING

The selection of approaches and technologies for rural electrification, the design of their associated promotion instruments and the implementation of mini-grid projects requires a significant amount of technical and financial expertise and an ability to make prudent and practical decisions about trade-offs. Unfortunately, training institutions in partner countries are rarely able to equip electrification decision-makers and practitioners with the skills needed to design and assess policies, understand and deploy technologies, grasp electricity users' needs and ability to pay, and operate and maintain systems. As a result, many countries are littered with failed demonstration projects – poorly sized, unsafe, over-engineered, under-maintained or just badly functioning systems. Poor-quality training and uncoordinated capacity development that fails to meet sector and industry requirements, training courses that lack certification, and unqualified trainers are just some of the key issues hindering the development of the mini-grid sector and damaging the reputation of mini-grid systems.

GIZ supports partner countries to strengthen and enhance the skills and expertise of individuals and organisations work-

ing on mini-grids through targeted capacity development measures (e.g. training, seminars, courses, exposure visits) and hands-on advice. GIZ works with academic and professional education institutions to (a) develop training programmes and vocational training curricula and competency standards for technicians and managers, and (b) integrate these in the offerings of institutions and enterprise incubators. GIZ facilitates tailor-made training for small and medium-sized enterprises (SMEs) that supports the development of appropriate business models and promotes investment readiness. The training can cover areas including technical knowledge, strategic planning, financial analysis, and marketing and sales. These interventions help in developing the workforce required to build and operate mini-grids. Partnerships between universities and technical training institutes increase the outreach of the training courses. To support public sector actors (ministries, rural electrification agencies, regulators), GIZ usually seconded relevant experts to key institutions in the partner countries, offers training courses on policy and regulation, and runs exposure visits and dialogue events. This proximity to actors enables GIZ experts to better understand where support is needed and how best to deliver it.

In *Pakistan* GIZ provided technical assistance and training to public and private partners on the development of solar and hydro off-grid power projects.

In *Kenya* and *Uganda* GIZ helped to develop high-level vocational training curricula for experienced solar technicians and worked with education institutions on adopting the curricula and implementing the training. GIZ also developed community training materials to raise communities' awareness about the importance of connecting to mini-grid electricity, the productive uses of energy, and electrical safety.

To facilitate its interaction with local communities in *Indonesia*, GIZ prepared a management training manual for villages covering the different aspects of mini-grid operation. It also provided the mini-grid operators with troubleshooting posters for on-site display that help them to identify and tackle operational issues as and when they arise.

GIZ facilitated the provision of training to *Rwandan* financiers on assessing renewable energy and mini-grid projects and their related risks.



## FOSTERING PRODUCTIVE USE AND RURAL ENTERPRISE DEVELOPMENT

The productive use of energy is important, not only because it acts as the main channel for translating energy access into poverty reduction by generating employment and income, but also because of its role in ensuring the sustainability of energy access interventions both technically and financially. Creating, enhancing and maintaining electricity demand through productive use are some of the activities that can ensure the sustainability of mini-grid operations. Productive uses of energy and of electricity in particular are extremely valuable in securing and augmenting the revenue stream for mini-grid operations. In general, customers who use electricity for productive uses not only are more influential in their community and more business oriented, but also represent a high-value segment in the overall electricity consumption and sale market. The effects of productive use are therefore pivotal for mini-grid operators of any scale. When businesses are connected to the electricity network, they tend to use the electricity more heavily, thus improving the capacity utilisation and overall profitability of the electricity supply system.

GIZ is actively promoting productive uses of energy to support entrepreneurship among electricity users and the beneficiaries of electrification. Interventions include the assessment of baselines, identification of relevant and appropriate productive uses, introduction of productive use technologies, and the training of local entrepreneurs and users of productive use equipment. Sometimes GIZ also provides assistance on the technology development and proof of concept process. Besides realising long-term economic benefits through increased and more diverse entrepreneurial activities, GIZ promotes local ownership and empowerment by enhancing people's skills and developing the required capacity. To this end, GIZ identifies relevant best practice examples, promising business opportunities and appropriate technologies, and then shares these with its partners and through web-based channels, international conferences and events.

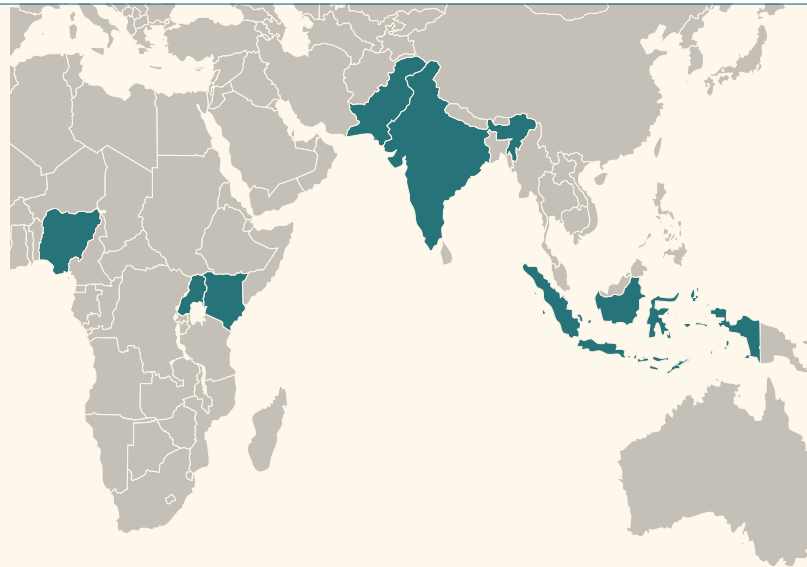
In *Pakistan* GIZ supported the promotion of productive energy use as a downstream activity of a micro-hydropower mini-grid, and did so ensuring equal opportunities for both men and women.

In *Indonesia* GIZ ran a series of training events to develop the capacities of local businesses and encourage greater numbers of rural entrepreneurs and rural cooperative members to incorporate the use of electricity supplied by mini-grids in their business start-ups and operations.

In *Nigeria* GIZ implements training and awareness-raising campaigns in all villages connected to a GIZ-supported mini-grid. These activities focus on promoting productive uses related to agriculture, such as electrically powered water pumping and milling.

In *Kenya* GIZ developed a guidebook on the options for stimulating electricity demand in existing or planned mini-grids and on how to integrate the promotion of productive electricity use into the various stages of the project's lifecycle.

In *Uganda* GIZ is developing a microfinance facility that provides affordable loans to fund climate change adaptation



measures involving the use of renewables, such as electrically powered pumps, irrigation systems, mills and refrigeration units.

GIZ *India* ran an awareness-raising campaign in selected rural areas on the advantages of using solar electricity over diesel for running equipment like irrigation pumps, rice hullers, flour mills, oil expellers, and fodder cutting machines.

## TAPPING THE POTENTIAL OF HYBRID SYSTEMS

A large proportion of the thousands of mini-grids, island power systems and isolated stand-alone power applications in operation around the world today produce their electricity using diesel generators. However, dependency on diesel imports, the volatility of diesel prices and the severe environmental impacts caused by carbon dioxide emissions and fuel spills make diesel an increasingly unattractive option for power generation. Diesel generators are often poorly maintained, resulting in lower levels of reliability and diminished quality of service. Building renewable-energy mini-grids and hybridising existing diesel generators with renewable energy can substantially mitigate these issues. The International Renewable Energy Agency (IRENA) estimates that diesel generators used in isolated grids worldwide have a combined capacity of 23 GW and, as such, constitute an enormous potential market. In Nigeria alone, the estimated installed capacity of stand-alone petrol/diesel generators used for self-consumption is estimated at 6 GW. However, despite the growing economic attractiveness of hybridisation projects, significant investments

and tailor-made business models are required to meet the relatively high costs of renewable energy expansion and turn previously inefficient power systems into financially viable investments. Islands offer attractive opportunities for reducing diesel consumption. 11% of the global population lives on islands and most of the world's islands are highly dependent on oil-based power supply. As a result, the cost of electricity in these locations is often higher than 40 €cent/kWh.

GIZ helps partner countries to develop strategies for reducing their dependence on fossil fuel imports and to mitigate the negative impacts of greenhouse gas emissions. GIZ provides decision-makers with support on evaluating suitable finance and operator models, assessing different power supply options and elaborating viable approaches for fuel handling, system operation, distribution loss reduction and demand-side management. To address investors' perceptions of risk, GIZ is also developing standards for the financial assessment and planning of hybrid systems.

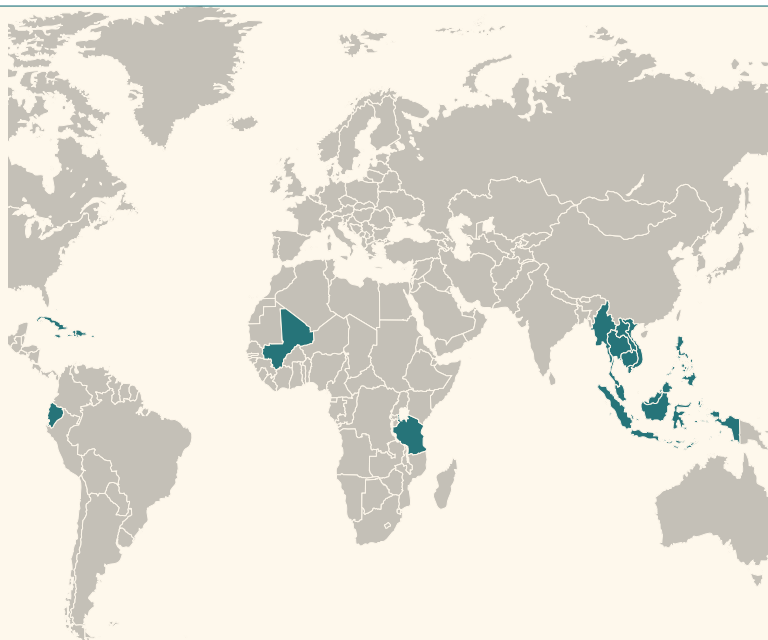
In the *Caribbean* GIZ is working with several island nations to develop rules for independent power producers and incentive schemes for hybridising island power grids.

In *Southeast Asia* GIZ is helping countries to identify potential sites for hybridisation and implement pre-feasibility studies.

In *Mali* GIZ delivered a training programme on the quality criteria to consider when seeking to procure optimal retrofitting solutions for diesel power plants.

In *Ecuador* GIZ is providing the operators of diesel generators with support on switching from diesel to biomass fuels.

In *Tanzania* GIZ took long-term load measurements in relevant market segments to generate the data that the private sector needs to carry out technical and economic evaluations of hybrid systems.





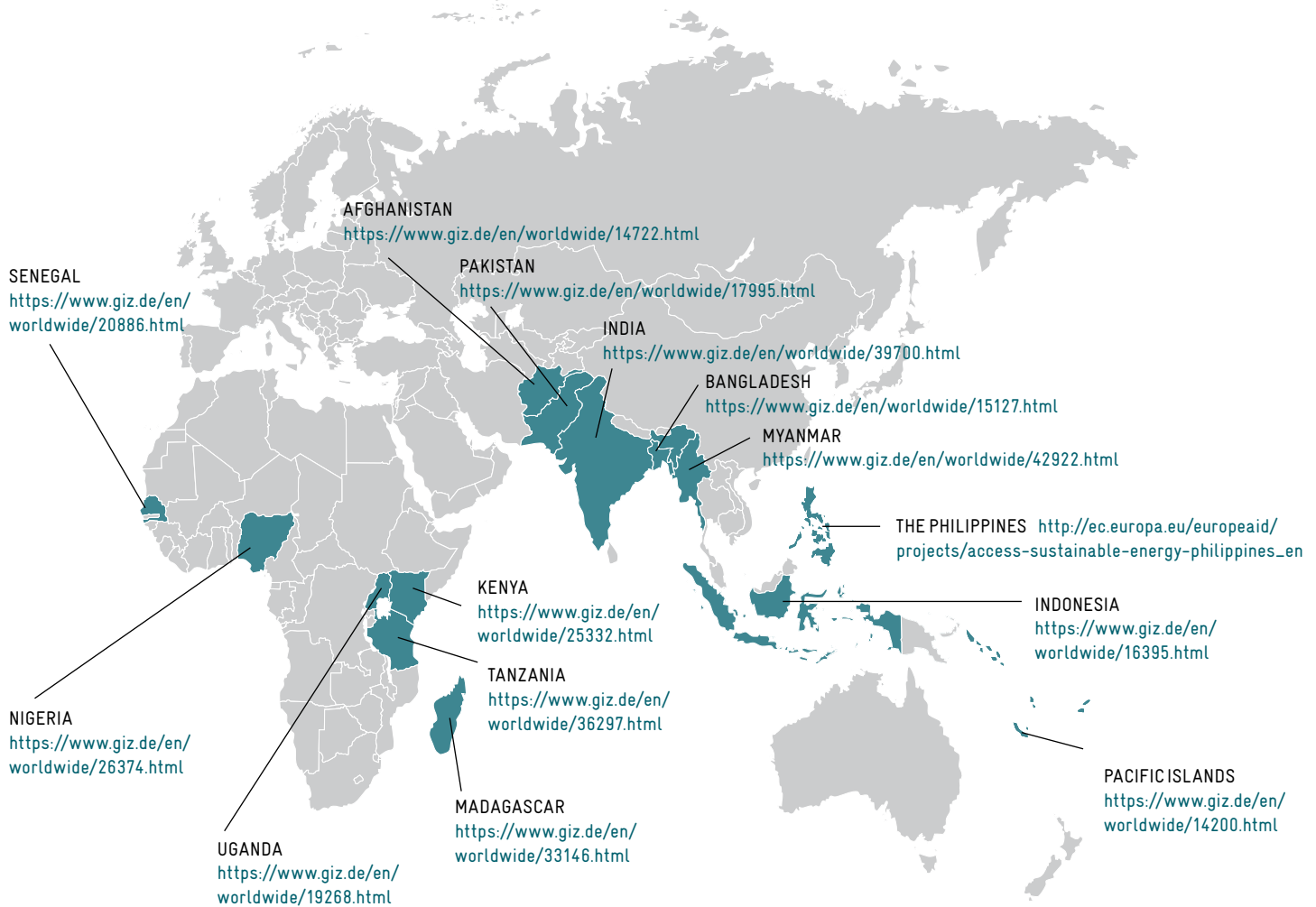




# FLAGSHIP PROGRAMMES AND INITIATIVES

## BILATERAL PROGRAMMES

On behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) and the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), GIZ is implementing bilateral technical assistance programmes on the development of mini-grids in countries including Afghanistan, India, Indonesia, Kenya, Madagascar, Myanmar, Nigeria, Pakistan, the Philippines, Senegal, Tanzania and Uganda, and also in a number of Pacific island states. Many of these programmes receive cofinancing from other donor governments, the European Union or philanthropic organisations.



## ENERGISING DEVELOPMENT (ENDEV)

Working in close partnership with the Netherlands Enterprise Agency (RVO), GIZ coordinates the global programme of the multi-donor partnership Energising Development (EnDev), which promotes the supply of modern energy technologies to households and small-scale businesses. The partnership is funded by Germany, the Netherlands, United Kingdom, Switzerland, Sweden and Norway and works with 25 countries in Africa, Asia and Latin America. In several of the countries where EnDev is active, mini-grids based on hydro and solar power are supported.

### Link

ENDEV [http://endev.info/content/Main\\_Page](http://endev.info/content/Main_Page)

## EU ENERGY INITIATIVE PARTNERSHIP DIALOGUE FACILITY (EUEI PDF)

GIZ holds the secretariat for the EUEI PDF, which provides policy support to a number of countries on behalf of several EU member states. In the framework of activities under the Renewable Energy Cooperation Programme (RECP) of the Africa-EU Energy Partnership, EUEI PDF has been involved in implementing several mini-grid related activities, including bankability support for project developers, market studies on mini-grids, B2B events and policy support (e.g. the *Mini-grid Policy Toolkit*).

### Links

EUEI PDF <http://www.euei-pdf.org/>  
 RECP <https://www.africa-eu-renewables.org/>

## CLEAN ENERGY MINI-GRID HIGH IMPACT OPPORTUNITY (HIO)

The Clean Energy Mini-grid HIO was initiated by a group comprising the Alliance for Rural Electrification, the Department for International Development, the EUEI PDF, GIZ, the Secretariat of Sustainable Energy for All (SE4All), the United Nations Environment Programme and the United Nations Foundation. The HIO, which falls under the Sustainable Energy for All (SE4All) initiative, aims to tackle the major challenges facing the mini-grid sector by facilitating coordination and cooperation among key stakeholders in the sector.

### Link

CLEAN ENERGY MINI-GRID HIO [http://www.se4all.org/hio\\_clean-energy-mini-grids](http://www.se4all.org/hio_clean-energy-mini-grids)

## ENERGYEDIA

Launched with GIZ's support, Energypedia is an online open-source knowledge platform on energy. Many of GIZ's experiences and lessons learned have been shared with practitioners through the platform in the form of short articles with links to literature and relevant materials. GIZ is also working with members of the mini-grid HIO group (see above) to develop a portal on mini-grids that will be added to Energypedia. The portal will contain relevant knowledge, tools and practical information on aspects related to mini-grid development and implementation.

### Link

ENERGYEDIA [https://energypedia.info/wiki/Main\\_Page](https://energypedia.info/wiki/Main_Page)

## PROJECT DEVELOPMENT PROGRAMME (PDP)

GIZ implements the Project Development Programme (PDP) in sub-Saharan Africa and Southeast Asia as part of the Renewables – Made in Germany initiative, which is coordinated and financed by the German Federal Ministry for Economic Affairs and Energy (BMWi). In close cooperation with the German bilateral chambers of commerce, PDP supports German SMEs active in the renewable energy sector to enter foreign markets, bundling traditional tools of foreign trade support with instruments of development cooperation. In the field of mini-grids, PDP facilitates the transfer of know-how and technology from Germany to sub-Saharan Africa and Southeast Asia and contributes to developing the market by identifying potential sites and risk mitigation approaches.

### Link

PDP IN SUB-SAHARAN AFRICA <https://www.giz.de/en/worldwide/14915.html>



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