

ENERGY  
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# Country Guide: Ethiopia

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Ethiopia is Africa's oldest independent country and its second largest in terms of population. Apart from a five-year occupation by Mussolini's Italy, it has never been colonised. It is a landlocked country in the Horn of Africa. It shares borders with Eritrea to the north, Djibouti and Somaliland to the northeast, Somalia to the east, Kenya to the south, South Sudan to the west and Sudan to the northwest. It served as a symbol of African independence throughout the continent's colonial period, and was a founding member of the United Nations and the African base for many international organisations.

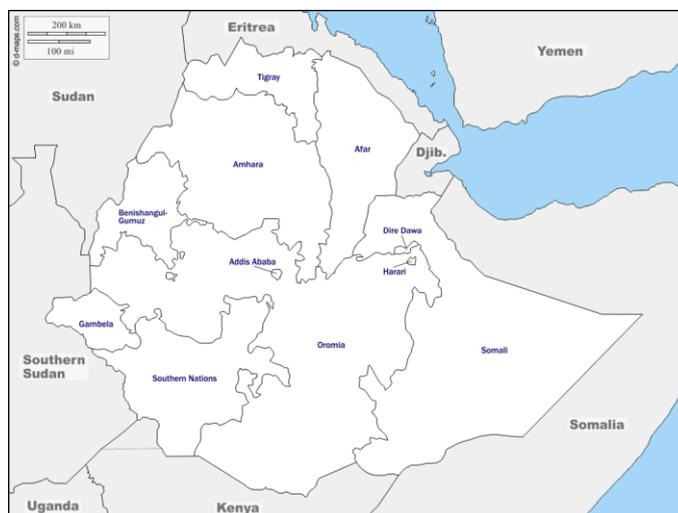


Figure 1 Map of Ethiopia. Source: d-maps

Ethiopia's location gives it strategic dominance as a jumping off point in the Horn of Africa, close to the Middle East and its markets. Being landlocked, it has been using neighboring Djibouti's main port for the last two decades. However, with the recent peace with Eritrea, Ethiopia is set to resume accessing the Eritrean ports of Assab and Massawa for its international trade.

Table 1: Ethiopia at a glance

<b>Capital</b>	Addis Ababa
<b>Total Area</b>	1,100,000 km <sup>2</sup>
<b>Population</b>	109 million (2018 estimate)
<b>Official languages</b>	Amharic
<b>Rural Population</b>	79% (2018)
<b>GDP</b>	US \$ 80,289M (2018)
<b>GDP Per Capita</b>	US \$ 772.3 (2018)
<b>Currency</b>	Birr (ETB)
<b>Exchange rate 01/03/2020</b>	1 GBP = 41.345 ETB
<b>Exchange rate 01/03/2018</b>	1 GBP = 37.398 ETB
<b>Access to Electricity</b>	40% (2018)

### Demographics and economics

With about 109 million people (2018), Ethiopia is the second most populous nation in Africa after Nigeria, and the fastest growing economy in the region. However, it is also one of the poorest, with a per capita income of \$772. Ethiopia aims to reach lower-middle-income status by 2025.

Ethiopia's economy experienced strong, broad-based growth averaging 9.9% a year from 2007/08 to 2017/18, compared to a regional average of 5.4%. Ethiopia's real gross domestic product (GDP) growth decelerated to 7.7% in 2017/18. Industry, mainly construction, and services accounted for most of the growth. Agriculture and manufacturing made lower contribution to growth in 2017/18 compared to the previous year. Private consumption and public investment explain demand-side growth, the latter assuming an increasingly important role.

Higher economic growth brought with it positive trends in poverty reduction in both urban and rural areas. The share of the population living below the national poverty line decreased from 30% in 2011 to 24% in 2016. The government is implementing the second phase of its Growth and Transformation Plan (GTP II) which will run to 2019/20. GTP II aims to continue expanding physical infrastructure through public investments and to transform the country into a manufacturing hub. GTP II targets an average of 11% GDP growth annually, and in line with the manufacturing strategy, the industrial sector is set to expand by 20% on average, creating more jobs.

Ethiopia's main challenges are sustaining its positive economic growth and accelerating poverty reduction, which both require significant progress in job creation as well as improved governance. The government is devoting a high share of its budget to pro-poor programmes and investments. Large scale donor support will continue to provide a vital contribution in the short-term to finance the cost of pro-poor programmes. Key challenges are related to:

- Limited competitiveness, which constrains the development of manufacturing, the creation of jobs and the increase of exports.
- An underdeveloped private sector, which limits the country's trade competitiveness and resilience to shocks. The government aims to expand the role of the private sector through foreign investment and industrial parks to make Ethiopia's growth momentum more sustainable.
- Political disruption, associated with social unrest, could negatively impact growth through lower foreign direct investment, tourism and exports.

Ethiopia is a member of 47 international organisations including the African Union, the United Nations, COMESA, Inter-Governmental Authority on Development (IGAD) and the African, Caribbean, and Pacific Group of States (ACP).

In the yearly World Bank survey on "Doing Business", a comparison of business regulation in 190 economies, Ethiopia has a poor score. The 2020 edition of Doing Business ranks Ethiopia as 159 out of 190 economies with a score of 48.0 out of 100 in the ease of doing business. Other indicators of the survey include scorings for starting a business, dealing with construction permits, getting electricity, registering property, getting credit, protecting minority investments, paying taxes, trading across borders, enforcing contracts and resolving insolvency. Figure 2 provides a comparison of Ethiopia to similar economies for starting a business.

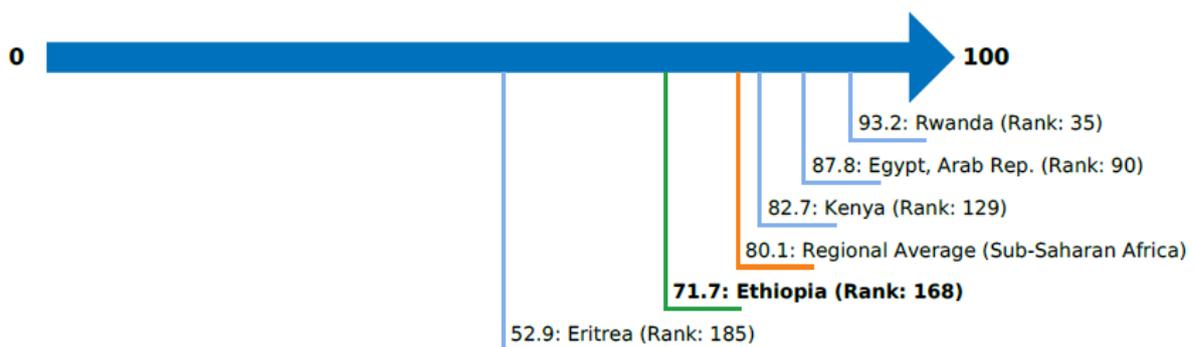


Figure 2: Doing Business 2020 score for starting a business. Data from: World Bank Group, 2020

## Energy

Ethiopia has the second-highest installed available capacity for electricity generation in Sub-Saharan Africa, at 4,206 MW. This is made up of 3,743 MW (89%) of hydropower, 337 MW (8%) from wind, and 126 MW (3%) from thermal sources. This is supplemented with 5.5 MW of imports. It has a well-developed transmission and distribution network, with nearly 80% of the population living in proximity to medium-voltage transmission lines. It has abundant sources of renewable energy just waiting to be tapped – including wind, solar and geothermal – enough to easily supply the power needs of the country

Despite the impressive grid expansion in Ethiopia to date, the percentage of electrified households remains low at only about 40%. The Government's recently launched National Electrification Program envisions that by 2025, 65% of the population will be connected to the grid, as it places a strong emphasis on scaling up connections in areas within short-term reach of the grid.

The other 35% – or around 7.7 million households – will need an interim off-grid solution while waiting for grid expansion, or even a permanent one where appropriate, such as in very remote areas where grid access will remain too costly and logistically challenging even in the long term.

A state-of-the-art geographic information system (GIS) will be used to optimize the planning for both the grid- and off-grid infrastructure, and act as a monitoring and evaluation platform for the program.

This discrepancy – between abundant resources and unmet needs – points to the need for a radical new approach. The National Electrification Programme 2.0 has three key operational action elements:

1. A fast-paced, ambitious grid connections rollout programme implemented by the EEU, designed for scaling up connectivity from 6.9 million households today to over 15 million households in customer count terms by 2025 (equivalent to about 65% of the population in 2025)
2. A complementary off-grid access rollout programme, targeted to provide access for the remaining six million rural and deep rural households (equivalently to about 35% of the population in 2025) with a combination of public and private-led efforts
3. Explicit cross-sectoral linkages with the productive and social services sectors and in support of vulnerable groups, for the achievement of 100% access by 2025 at the latest in the case of primary and secondary schools, hospitals, and primary health centres. In addition, the NEP provides for priority connection (grid or off-grid) to locations with high economic growth potential—particularly in the agriculture sector—and targeted assistance for safety net beneficiaries, while ensuring gender equality in access to electricity services.

The Ethiopia energy sector still faces challenges, such as:

1. Limited experience in IPP-based generation (small scale power producer)
2. Overlapping mandates of key institutions
3. Heavily subsidised national flat-rate tariff (less than USD 3c/kWh), while marginal costs to grid supply is 7c/kWh
4. Major export of power - should re-finance own energy projects (7-8c/kWh paid by Kenya and Tanzania)
5. Focus on village rather than household connections: potential lack of domestic demand for installed generation capacity in the future
6. In remote areas, low per capita consumption hinders mini-grid development

**Table 2: Overview of the main stakeholders in the energy sector in Ethiopia**

Institution	Role
<b>Ministry of Water, Irrigation and Electricity (MoWIE)</b>	Responsible for the overall development of the energy sector in the country.
<b>Ministry of Environment, Forest and Climate Change (MoEFCC)</b>	Regulatory policy and decision making, environmental, climate related operations and implementing improved cookstoves solutions (ICS) and climate change mitigation.
<b>Ethiopia Energy Authority (EEA)</b>	Regulates energy efficiency and conservation, regulates the electricity sector, and issues technical codes, standards and directives.
<b>Ethiopian Electric Utility (EEU)</b>	Constructs and maintains electric distribution networks, purchases bulk electric power, sells electrical energy to customers, and initiates electric tariff amendments approval.
<b>Ethiopian Electric Power (EEP)</b>	Undertakes feasibility studies, design and survey of electric generation, transmission and substation construction and upgrading, handles electricity generation and transmission operational and maintenance activities, leases electricity transmission lines, sells bulk electric power and undertakes universal electric access works.
<b>Ethiopian Rural Energy Development and Promotion Centre (EREDPC)</b>	Mandated to carry out national energy resources studies, data collection and analysis, rural energy policy formulation, technology research and development and to promote appropriate renewable energy technologies in rural areas.
<b>Rural Electrification Fund (REF)</b>	Enables private and cooperative engagement in rural electrification activities through loan-based finance and technical support.

## Small hydropower

Small scale hydropower is estimated to be 10% of the total hydropower potential of the country. However, in terms of technical feasibility, the potential could be reduced by more than half to about 5% due to inaccessibility, and proximity to grid and service centres. The available potential of small-scale hydropower in the country has hardly been exploited so far due to government focus on large scale hydropower development to meet the energy demand of the country.

In a feasibility study, the government identified around 299 hydropower potential sites within 11 river basins with a total potential of 7877 MW including both large and small hydropower. The Abay river basin is the largest basin in terms of hydropower potential site, estimated about 79000 GWh/yr, which covers about 49% of all river basins. The potential for small scale hydropower lies in western and southwestern Ethiopia, where annual rainfall ranges from 300mm to over 900mm, especially in the Omo Gihbe and Abay basins.

The following are the drivers of small-scale hydropower development in Ethiopia by the government to spur the market:

1. Favourable renewable energy policy: the policy favours the development of electric power from renewable energy sources and an established Ethiopian energy agency to be mandated to regulate the electricity

market, electricity price regulation, power purchase agreement (PPA), licensing of independent power producer (IPP), and regulating access to the grid by private power producer.

2. Establishment of Ethiopian rural energy development and promotion centre (EREDPC): it is established at federal level with a mandate to promote renewable energy technology for rural electrification by setting aside rural energy fund by collecting donations from different organisations and governments and giving soft loans with low interest rates for private power producers.
3. Feed in tariff: the government of Ethiopia announced feed in tariff for power purchased from IPPs for different types of renewable sources.
4. Introduction of climate resilient green economy strategy (CRGE): Ethiopia initiated and implemented this policy strategy to participate in the global climate change mitigation campaign and protect the country from climate change, and as a result planned to develop 25 GW of electricity from renewable energy.

The following are the barriers to hydropower development:

1. Absence of expertise to produce parts, install and maintain small hydro power plants
2. Inaccessibility of small and micro hydropower spare parts on a local scale
3. Low proposed feed in tariff results in low return on investment for IPPs
4. Expansion of irrigation projects in small rivers may prevent hydropower development downstream

## Solar energy

Ethiopia has a high degree of solar PV potential (see Figure 3). The country's irradiation levels average around 5.2 kWh/m<sup>2</sup>/day, which provide the perfect conditions for the development of both utility-scale PV plants and off-grid SHS solutions. The Ethiopian government plans to have at least 500MW of installed solar capacity by 2020. Over the past five years, Ethiopia's solar PV capacity has almost tripled. However, despite the abundant solar resources in the country, as of 2019, only 14MW have been installed, representing 0.3% of the country's total energy capacity. Solar capacity in Ethiopia is expected to soar soon with several large-scale projects under development. The following are the announced solar PV projects in Ethiopia:

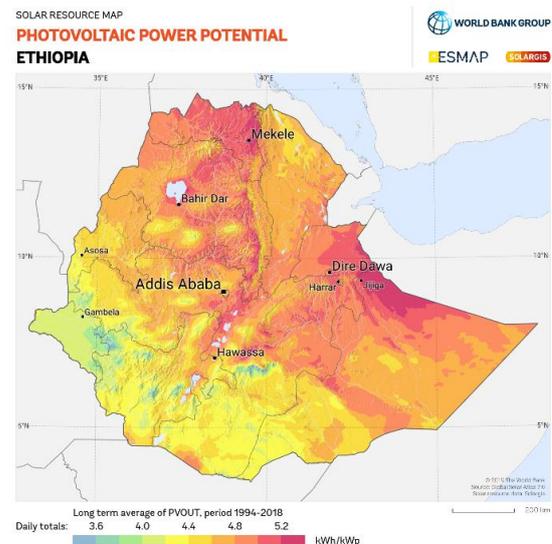


Figure 3: Solar resource Ethiopia (2019 The World Bank, Source: Global Solar Atlas 2.0, resource data: Solargis)

**Table 3: Announced solar PV projects in Ethiopia**

Project name	Size (MW)	Region	Status
<b>Metehara Solar</b>	100	Oromia	Awarded
<b>Gad Solar Scale (Phase 1)</b>	125	Somali	Awarded
<b>Dicheto Solar Scale (Phase 1)</b>	125	Afar	Awarded
<b>Mekele Solar</b>	100	Tigray	Pending RFP
<b>Humera Solar</b>	100	Tigray	Pending RFP
<b>Welenchiti Solar</b>	150	Oromia	Pending RFP
<b>Weranso Solar PV</b>	150	Afar	Pending RFP
<b>Metema Solar PV</b>	125	Amhara	Awaiting approval
<b>Hurso Solar PV</b>	125	Dire Dawa	Awaiting approval

### Biomass energy

A marked feature of Ethiopia's energy sector is the high dependence on biomass (firewood, charcoal, crop residues and animal dung). It is estimated that biomass energy accounted for 90% of the final energy consumption (36.9 out of 40.9 MTOE) in 2018, 99% of which is consumed in the residential sector. Nearly 60 million tons of biomass are consumed for energy purposes, with about 81% of the estimated 16 million households using firewood and 11.5% of them cooking with leaves and dung cakes.

The very high degree of dependence on wood and agricultural residues for household energy has impacts on the social, economic and environmental well-being of society. Growing demand for biomass together with increased demand for agricultural output (land for crop production, livestock feed) has resulted in reduced access to wood fuels.

The successful development of the country's biomass energy resources has been hampered by a combination of factors, including poor institutional framework, inadequate planning, and lack of coordination.

Strategies developed previously (the Rural Biomass Energy Strategy Report of 2004 and the draft Rural Energy Strategy of 2007) have not led to the required results. The reasons were the lack of ownership by the key institutions and the lack of a comprehensive approach including all related sectors.

A national energy policy was drafted in 2013 but is yet to be endorsed by the Council of Ministers. Clean cooking and bioenergy policies include the promotion of clean and efficient technologies, particularly for the household sector and sustainable bioenergy production.

The Biomass Energy Strategy (BEST), issued in 2013, proposes increasing the biomass energy supply base through the promotion of fast-growing trees, increasing biomass fuel use efficiencies, and integration of the BEST strategy into energy policy and a special policy on charcoal.

The government established the National Improved Cookstoves Program (NICSP) in 2013, to run up to 2030 with five-year phases aligned with the government's Growth and Transformation Plan (GTP). The main objective of the programme is to support the government's GTP targets for improved cookstove adoption and dissemination by creating a vibrant market for improved cookstove technologies through relevant institutional capacity development and strong support of private sector involvement. It will also contribute to realisation of the Climate Resilient Green Growth Strategy of reducing emissions from deforestation and forest degradation and ensuring access to clean energy.

## Wind energy

Ethiopia has good wind resources with velocities ranging from 7 to 9 m/s. Its wind energy potential is estimated to be 10,000MW. The Ethiopian National Meteorological Services Agency (NMSA) began work on wind data collection in 1971 using 39 recording stations in selected locations. Ever since the establishment of these stations, wind velocity is measured, and data made available to consumers.

Lack of organised data on wind energy potential in entire regions of the country has been one of the reasons for restricted applications in Ethiopia. But recently, wind energy resources have been identified in more regions. The government has committed itself to generate power from wind energy plants by constructing eight wind farms over the 5-year Growth and Transformation Plan (GTP) period between 2011 and 2015. However, only two have been constructed: the Ashegoda Wind Farm, about 700km north of Addis Ababa (120 MW) and the Adama Wind Farm (51 MW), 80km south of Addis Ababa.

## Geothermal

Ethiopia's geothermal resources are estimated to be 5GW, of which 700 MW are suitable for electric power generation. Geothermal resources are primarily located in the Rift Valley area of the country. Only one 7.3 MW geothermal power plant has been commissioned so far, which started operating in 1998/1999.

Exploration of geothermal resources is still ongoing. Corbetti, Tulu Moye and Abaya sites were licensed for exploration by a private firm.

## Mini grid sector development

The rate of mini grid development in Ethiopia has traditionally been very low. By 2019, only two mini grid companies were active in Ethiopia, with only two mini grid projects in operation and four under construction. This low uptake has mostly been due to a challenging legal and regulatory framework for mini grid developers. Some of the challenges include:

- Cumbersome licensing processes
- State monopoly in electricity distribution
- No framework for mini grid concessions
- A transparent grid extension plan, but no provisions for grid arrival for mini grid developers
- A heavily subsidised national grid tariff that mini grids must compete with
- Unclear tax and import duty exemption terms for solar products
- A closed trade system that does not allow for foreign companies to be involved in the distribution of solar products
- Provision for subsidies, but no clear source of funding

The government, however, recognises the need for mini grids to improve the electricity access situation in the country and has started to make plans for mini grid inclusion in the country's electrification strategy. The National Electrification Program 2.0. (NEP 2.0), updated in 2019, aims for universal access to electricity by 2025, 35% of which will be from mini grids and standalone solar systems. This is a huge step, given that the government has traditionally prioritised grid extension. Some of the mini grid specific steps being taken to work towards these goals include:

- Tariff guidelines and methodology for off-grid systems, a directive for the licensing of off-grid electricity supply, and design standards for rural electrification - however, these guidelines are yet to be approved
- Securing investment to implement the NEP
- Setting up a credit facility to support companies that import and assemble standalone solar, biogas and wind systems, though this credit facility does not extend to mini grids
- Provision for rapid assessment of locations with high potential for productive use of electricity to inform mini grid design and implementation

The two private companies active in mini grid space in Ethiopia are the Ethios Resource Group and Rensys Engineering and Trading PLC.

Organisations such as GIZ, NRECA and RMI have taken part in mini and micro grid development in Ethiopia, but the number of systems set up is unknown at the time of writing this guide.

The table below highlights some of the active mini grid and off grid energy programmes in the country.

Table 4: Active support programmes in Ethiopia

Programme	Main activities
<b>Ethiopia Electrification Program (ELEAP) (2018 – 2023)</b>	The objective is to increase electricity access and to enhance institutional capacity for planning and implementation of the National Electrification Program (NEP). The NEP is organised into three pillars addressing the dominant challenges of the sector: Pillar 1: On-grid electrification; Pillar 2: Off-grid service provisioning; and Pillar 3: Sector capacity and institutional reform.
<b>Ethiopia Off-Grid Renewable Energy Program (2018 – 2025)</b>	A nation-wide programme that targets population without access to electricity for basic uses. The programme supports the implementation of a variety of off-grid renewable energy technologies, including solar lamps/lanterns, solar home systems, institutional solar PV plants, mini-hydropower plants and solar pumps for irrigation.
<b>Electricity Network Reinforcement and Expansion Project (ENREP) (2012 – 2021)</b>	The objectives of ENREP are to improve reliability of the electricity network and to increase access to electricity services in Ethiopia. The project's four components are: <ol style="list-style-type: none"> <li>1. Reinforcement and expansion of the electricity network</li> <li>2. Access to scale-up in the areas with grid access</li> <li>3. Market development for renewable energy and energy efficient products</li> <li>4. Development of stand-alone renewable energy programmes such as solar home systems, solar lanterns, improved cook-stoves, biogas plants, and similar activities for additional coverage for household access to energy</li> </ol>
<b>Renewable Energy Guarantees Program (REGREP)</b>	The programme aims to support the development of over 1,000MW of solar and wind energy through independent power producer (IPP) models.
<b>AECF/REACT SSA project</b>	Funding support for SHS companies, mini grid companies, clean cook stove companies, innovative distribution models for off-grid energy, and innovative ideas to stimulate "next generation" approaches to renewable energy. \$6.7 million is dedicated to companies in Ethiopia.

Table 4: Active support programmes in Ethiopia

<b>The Green Mini Grid Help Desk</b>	Mini grid developers receive technical assistance, from support on demand assessments to technical sizing, capital raising, procurement and installation support, commissioning, and optimisation of operations.
<b>Power Africa Off-grid Project (PAOP)</b>	Provided technical assistance and targeted grant funding to the off-grid energy sector. Currently implementing an energy remittances programme in Ethiopia to address Ethiopia's FOREX gap. Product providers of remittances get payments in foreign currency to help replenish inventory.
<b>The Africa Energy Program</b>	Supporting development partners and the government in identifying suitable off-grid solutions, outline the role of mini grids in the NEP, and promote productive use of energy.
<b>EnDev 2</b>	A GIZ programme promoting off-grid electrification through community-owned pico hydro power and micro hydro power in off-grid rural areas, as well as solar PV for health centres. Provides partial financing for capital costs for the hydro projects and the solar PV components. Promoting the dissemination of improved cook stoves (ICS) to reduce fuel consumption. This is through support to micro-enterprises in setting up an ICS business and supporting in market linkages.

## Industry associations

**Solar Energy Development Association (SEDA-E)** is an independent non-profit association dedicated to facilitating the growth and development of solar energy businesses in Ethiopia. SEDA-E was established in September 2010 by dedicated solar energy market stakeholders in Ethiopia. Its key roles are promoting the interests of members of the solar energy industry among government, public sector, the general public and any other organisations that may impact the development of the industry; and the creation of a forum for the dissemination and exchange of information and ideas on matters relating to solar energy development and utilisation in Ethiopia. The association was relaunched in 2019 as a business association and was renamed the Solar Energy Development Association (ESEDA).

## References and further reading

### **National Electrification Program 2.0**

<https://minigrids.org/wp-content/uploads/2019/04/Ethiopia-2.0.pdf>

### **Sustainability of Biogas and Solid Biomass Value Chains in Ethiopia**

<https://wedocs.unep.org/bitstream/handle/20.500.11822/30564/GBEPEthiopia.pdf?sequence=1&isAllowed=y>

### **Solar energy vision for Ethiopia**

[https://www.sun-connect-news.org/fileadmin/DATEIEN/PV-Industry-ET-04-09-12\\_final.pdf](https://www.sun-connect-news.org/fileadmin/DATEIEN/PV-Industry-ET-04-09-12_final.pdf)

### **Mini Grid Market Opportunity Assessment: Ethiopia**

<https://greenminigrid.se4all-africa.org/file/167/download>

### **Rapid Gap Analysis – Ethiopia**

[https://www.se4all-africa.org/fileadmin/uploads/se4all/Documents/Country\\_RAGAs/MWH - Updated-Rapid Gap Analysis.pdf](https://www.se4all-africa.org/fileadmin/uploads/se4all/Documents/Country_RAGAs/MWH_-_Updated-Rapid_Gap_Analysis.pdf)

### **Doing Business**

<https://www.doingbusiness.org/content/dam/doingBusiness/country/e/ethiopia/ETH.pdf>

### **Official UK Government travel advice for Ethiopia**

<https://www.gov.uk/foreign-travel-advice/ethiopia>

## Useful contacts

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