



Rapid Assessment Framework:

PAY-AS-YOU-GO SOLAR AS A DRIVER OF FINANCIAL INCLUSION

USAID Global Development Lab
Center for Digital Development
Strategy & Research

AUGUST 2017



USAID
FROM THE AMERICAN PEOPLE



INTRODUCTION

Pay-As-You-Go (PAYG) solar businesses provide household-scale solar energy with a payment scheme tailored to the budgets of bottom-of-the-pyramid customers. By allowing poor households to pay for solar products in small increments, PAYG solar is a viable option for households not currently served by a reliable grid, and is a cleaner, safer alternative to kerosene for lighting. Because PAYG solar systems are often integrated with mobile money (MM), sufficient MM infrastructure is a key enabler to scale solar off-grid energy (OGE). At the same time, demand for off-grid energy can encourage MM adoption. Under certain circumstances, this can lead—and has led—to a virtuous cycle of financial inclusion via accessible household services.¹

This assessment provides an overview of five key considerations relevant to determining where PAYG solar is more likely to drive financial inclusion through mobile money adoption. This assessment framework outlines five questions that cover key features of MM and energy markets. The goal is not to provide full market intelligence, but rather to inform the development of an investment strategy in PAYG that may contribute to a complementary goal of financial inclusion.

This framework outlines the five key questions of the rapid assessment and provides for each:

- a brief explanation of the relevance of the questions
- a list of resources with available data to inform the assessment
- secondary questions that could be answered through further research or collaboration

¹The solar company Mobisol estimated that 20 percent of their customers in Rwanda were newly registered MM users, and made their first MM bill pay transaction through Mobisol. Similarly, in Uganda, 1.3% of Fenix customers reported using MTN Mobile Money for the first time to pay for Fenix's ReadyPay Solar System.

ASSESSMENT FRAMEWORK

This framework identifies five key questions related to the enabling environment for PAYG solar and mobile money. This framework, along with the list of resources and secondary questions that follows, is intended to allow donors, investors, and PAYG providers to conduct their own rapid analyses using these questions as a starting point.

01	How broad is rural mobile coverage? PAYG solar can only drive MM adoption if customers can get a signal.
02	How much of the country is unelectrified and has access to mobile phones? PAYG solar is most attractive in areas without grid access, possibly also in areas with unreliable grid access. In either case, the off-grid populations need to have access to mobile phones to utilize an MM payment option.
03	How strong is mobile money infrastructure? MM-based business models are easier when there is some level of existing mobile money infrastructure.
04	How affordable is PAYG to target populations? Low incomes of off-grid populations and fuel energy subsidies can make it harder for solar energy to compete with alternatives.
05	How easy is it to do business? PAYG solar companies start small and tend to grow quickly. Ease of doing business, access to credit, and workforce capacity are important considerations for scale.

These questions may be answered using a variety of quantitative, qualitative, and geospatial data. Below we describe several data sources that are available publicly or to USAID and partners. To facilitate regional comparisons, this framework prioritizes questions that can be answered using data sources that include information for many countries. These data sources are intended to provide an initial overview of a market. More specific information may be available through additional sources, or by working with mobile network operator (MNO) partners or other key stakeholders who can provide more detailed market insights.



01 HOW BROAD IS RURAL MOBILE COVERAGE?

WHY

Mobile money growth depends on mobile coverage. PAYG solar can more immediately support MM adoption if customers can get a signal. Although there are successful off-network business models that make it possible to expand PAYG use in areas without mobile coverage, the simultaneous growth of mobile money and financial inclusion is greater in connected areas. Current coverage data help determine where in a country a PAYG solar company can go immediately. Areas without coverage may require other means of payment or further investments in mobile infrastructure before they can support MM adoption.

KEY INDICATORS

01	How high is mobile phone ownership in populated rural areas? This indicator assumes that mobile ownership is correlated with mobile coverage. It allows inferences to be made about mobile coverage in the absence of coverage data. Rural areas are a proxy for areas without grid electricity.
02	What is the number of unique mobile subscriptions? This indicator provides an overview of how prevalent mobile phones are and can be reviewed over time to get a sense of how quickly mobile phone adoption is growing.
03	What is the geographic coverage of mobile networks? This indicator shows where mobile coverage exists, but is often does not reflect consistency or quality of coverage.

RESOURCES FOR ANSWERS



Demographic and Health Surveys

Representative household survey reported in geographic clusters of 25–30 households. Respondents are asked about mobile ownership, not directly about coverage.

Advantages: Medium geographic detail. Additional information about health, assets, and so on.

Disadvantages: Some surveys are several years old; current numbers need to be estimated. Data are relatively difficult to clean and process (see example scripts [here](#)).



mAccess diagnostic tool

Provides interactive 2G and 3G coverage maps in web browser.

Advantages: High geographic detail.

Disadvantages: Data are self-reported by MNOs and may be outdated or inaccurate. mAccess is currently available to USAID and selected partners; outside users can request access.

Notes: mAccess also includes indicators on phone ownership provided by Research ICT Africa. These data are not geographically disaggregated and may not be current.



GSMA Intelligence

Provides quarterly values for industry-focused indicators, including market penetration, SIM cards per user, and MNO market shares.

Advantages: High temporal resolution. Includes information about market structure and competition.

Disadvantages: National-scale data only; no geographic or urban/rural details. Requires subscription for access.

SECONDARY QUESTIONS

01	What is the quality and consistency of mobile coverage?
02	What is the current landscape for mobile network competition? <ul style="list-style-type: none">• Which Mobile Network Operators (MNOs) are operating in this market?• Where are they expanding their coverage in the near future?
03	What are barriers to accessing mobile phone accounts? (e.g. SIM registration, cost, digital literacy)



02 HOW MUCH OF THE COUNTRY IS UNELECTRIFIED?

WHY

No electrification means there is a need for PAYG solar services; areas with unreliable grid access may also have high PAYG demand. Overlaying data about the extent of electrification with mobile ownership data provides a clearer picture of where PAYG solar may be a driver of MM adoption. Electrification rates may also have implications for the ability to charge devices. This in turn affects mobile ownership and use, which will be considered next.

KEY INDICATORS

01

What fraction of the population has access to electricity?

This indicator provides insight into the size of the market of PAYG; those with electricity are less likely to drive demand than those without.

02

To what extent does mobile phone ownership overlap with access to electricity?

In order to utilize MM for a PAYG repayment plan, unelectrified households need to have access to mobile phones.

RESOURCES FOR ANSWERS



Demographic and Health Surveys

Survey reported in geographic clusters of 25–30 households. Respondents were asked whether their household has electricity.

Advantages: Medium geographic detail. Additional information about health, assets, and so on.

Disadvantages: Some surveys are several years old; current numbers need to be estimated. Data are relatively difficult to clean and process (see example scripts [here](#)).



Living Standards Measurement Study

Survey reported in geographic clusters of around 10 households.

Advantages: Medium geographic detail; information about household assets and living standards. Often includes more electricity-related details: blackouts, costs, and so on.

Disadvantages: Data format not standardized between countries and years; analysis code can be difficult to re-use. Requirements for data access and reporting often more complex than DHS.



VIIRS Nightlights

Night-time satellite images showing stable light sources.

Advantages: High geographic detail.

Disadvantages: Noisy; lights from human settlements are mixed in with wildfires, gas flares, and so on. Large GeoTIFF files typically require GIS software. Nightlights images correlate better with outdoor lighting (such as streetlights) than with light sources inside of homes.



World Bank open data

Provides the fraction of national population with electricity access.

Advantages: User-friendly web interface.

Disadvantages: No sub-national geographic detail.



UNEP en.lighten Initiative Country Lighting Assessments

The Global Lighting Map of the en.lighten initiative provides an overview of energy efficient lighting policies in over 150 countries around the world. Individual Country Lighting Assessments provide a snapshot of the on-grid and off-grid populations.

Advantages: Provides off-grid population estimates measured by individuals and households, as well as estimates of average daily consumption. In addition, includes estimates of population with unreliable electricity access in selected countries.

Disadvantages: Data not geographically disaggregated, and may not be most current.

SECONDARY QUESTIONS

01	How reliable is the existing electric grid?
02	What are the existing plans for grid expansion?
03	How many private providers of off-grid energy are there?
04	What is the number of current off-grid energy company subscribers (by area)?



03 HOW STRONG IS THE MOBILE MONEY INFRASTRUCTURE?

WHY

Understanding the current mobile money infrastructure is critical for determining how easy it may be for PAYG clients to adopt MM for purposes of payment. PAYG providers may need to do little in markets where mobile money is already well-established. Where MM use is low, experience with bill pay functions, strength of agent networks, and investments in agent training and customer service to assist new users of mobile money are important considerations.

KEY INDICATORS

01	What is the existing level of mobile money use? This provides an indication of the extent to which MM is already normalized within the country.
02	To what extent is mobile money used for bill pay services? This provides an indication of how sophisticated MM users are. Many MM accounts are used primarily for remittances, which is often a simpler process than making payments. Where experience with bill payment is low, PAYG companies may need to consider strategies to ease the user experience of bill pay and ensure adequate customer service.
03	What is the strength and distribution of mobile money agent networks? This provides an indication of how burdensome using MM will be for new users. If there are no existing agent networks in the target area, users may have difficulty performing cash-in and cash-out functions that are necessary for widespread mobile money use.

RESOURCES FOR ANSWERS



Global Findex

Includes indicators on mobile account ownership, usage of mobile phones for payments, and mobile utility bill payment.

Advantages: Global-scale dataset that provides comparison on a variety of financial behaviors and technologies.

Disadvantages: No sub-national data available.



Financial Inclusion Insight Surveys

Nationally representative survey of mobile money users and behaviors in selected countries in Africa and Asia beginning in 2013. Captures data on MM use and mobile phone ownership as well as banking, financial numeracy, and over-the-counter transactions. Data available for Bangladesh, Benin, Ghana, India, Indonesia, Kenya, Nigeria, Pakistan, Rwanda, Senegal, Tanzania, and Uganda.

Advantages: Provides customizable reports and downloadable data. Data for mobile money use are disaggregated by gender, age, urbanicity, education, employment, and marriage.

Disadvantages: Only available for selected countries. Not all countries report on all indicators for all years.



IMF Financial Access Surveys

Captures geographic and demographic data linking use of financial services to economic growth. Since 2014, surveys have included indicators on MM, including the number of active accounts, registered accounts, and transactions, the total value of transactions, and the number and density of registered and active MM agent outlets.

Advantages: In 2014, 35 countries reported data on mobile money; includes data on agent outlets as well as accounts. Indicators are reported in multiple ways to aid comparisons, for instance, MM agents per square kilometer and MM agents by population density. Data available for download in Excel or Stata for custom analysis.

Disadvantages: Data available only for selected countries. Indicators that provide ratios of MM agents to population or to geographic area provide averages, which may mask significant variation between urban and rural populations.



MIX Finclusion Lab

A data analytics platform for financial inclusion supported by Mastercard Foundation, MetLife Foundation, Citi Foundation, and CGAP. The interactive dashboard feature allows users to look at multiple indicators of financial inclusion, including the number of MM access points. Users can also examine supply and demand by specifying a particular type of access point and one of many possible measures of demand.

Advantages: Includes over 30 countries from three regions (Africa, Asia, Latin America). Data focused on financial inclusion indicators related to access to financial services. Indicators are often disaggregated to provide details on mobile money agents. Data also geotagged for spatial comparisons at district and regional levels. Data are available for download.

Disadvantages: Data come from a variety of primary sources curated by the Finclusion Lab. The same data are not always available for every country. For the supply and demand feature, the available indicators vary by country, so it is best suited for an in-depth look at one country rather than comparison across countries.

RESOURCES FOR ANSWERS (CONTINUED)



Finscope

Nationally representative consumer surveys that measure the uptake of financial products and surveys, supported by FinMark Trust; have been conducted in 26 countries to date.

Advantages: Includes data from many countries and includes measures of financial inclusion at a sub-national level.

Disadvantages: Trademarked by FinMark Trust and requires a subscription. Sample sizes vary and indicators are often customized depending on interests of MNOs, who may fund additional questions. Data are not comparable across all indicators for all countries.

SECONDARY QUESTIONS

01	Which mobile money products are available in country?
02	Do any of the off-grid electricity companies have a partnership with national MNOs?
03	How interoperable are MM services and/or agent networks? Will PAYG customers have to use a specific MM product?
04	What transaction fees are associated with mobile money services? (High transaction fees can be prohibitive to those making frequent small value transactions.)
05	How user-friendly are MM products, and in particular, the bill pay functionality? (Complicated USSD processes can present challenges to new users.)
06	Are there any regulatory restrictions on who can become an MM agent? (For more, see this resource from CGAP)
07	Are MNOs allowed to lead mobile money offerings? What regulations may limit the role of MNOs in implementing mobile money? (For more, see this resource from CGAP)



04

HOW AFFORDABLE IS HOME SOLAR FOR TARGET POPULATIONS?

WHY

PAYG solar energy products are an easy sell when they are cheaper than or comparable to what households already spend on energy. Subsidies on kerosene or other energy sources can negatively impact demand for PAYG solar. Where subsidies exist, it may be possible to advocate to **redirect subsidies** to pro-poor cash transfers.

KEY INDICATORS

01

What are the incomes of off-grid populations?

This indicator suggests what types of solar products will be accessible to off-grid populations. Those living on less than \$2/day are unlikely to be able to afford solar home systems.

02

What do off-grid households currently spend on energy alternatives?

This indicator provides information on what level of payment will be competitive pricing for off-grid populations.

03

Are there existing energy subsidies?

This indicator provides information on the energy policy environment that may affect the ability of PAYG solar business models to compete with alternatives.

RESOURCES FOR ANSWERS



Off-Grid Solar Market Trends Report

Published by Bloomberg New Energy Finance and Lighting Global, report includes aggregated data on the demographics, income, and energy expenditures of off-grid populations.

Advantages: Provides comprehensive market research for PAYG solar companies.

Disadvantages: Not a primary data source, so the ability to do custom queries is limited. Focus is primarily on scaling off-grid solar; less emphasis on linkages with mobile money.



UNEP en.lighten Initiative Country Lighting Assessments

The Global Lighting Map of the en.lighten initiative provides an overview of energy efficient lighting policies in over 150 countries around the world. Individual Country Lighting Assessments provide a snapshot of the on-grid and off-grid population.

Advantages: The Off-Grid Country Lighting Assessment provides data on the total off-grid population and the number off-grid households, as well as pricing information, average daily operating hours, and average daily consumption of energy alternatives, including kerosene, candles, and batteries.

Disadvantages: Data for each country is not all reflective of the same time and often not current. Data range from collection dates of 2010–2013. Does not include information on how much off-grid households spend on cell phone charging, for which PAYG solar could provide potentially significant savings. Data are not disaggregated by region or income—reflects an average of all off-grid households.



International Energy Agency

Collects systematic measures of fossil fuel subsidy data from countries around the world

Advantages: Data collection dates back at least 10 years and is disaggregated by coal, natural gas, oil, and electricity. Data available for download include measures on the subsidization rate and the magnitude of subsidy as a per capita average. Webpage also includes links to data about current reform efforts.

Disadvantages: Focus of data is at global level and includes relatively high-level indicators. Does not include data on the on-the-ground experience of subsidies (such as how they translate to costs for individuals).

SECONDARY QUESTIONS

01	Is there a rent-to-own subscriber model (for those who may not be able to afford the initial payment)?
02	Are solar-related products and appliances zero-rated?
03	<p>What is the current regulatory environment for energy industry?</p> <ul style="list-style-type: none">• Are there any environmental agreements that may limit kerosene market expansion? Where are they expanding their coverage in the near future?• What taxes and duties will off-grid electricity companies have to pay?



05 HOW EASY IS IT TO DO BUSINESS?

WHY

PAYG providers are typically small or medium enterprises that may have long payback period for investment. Several factors related to the ease of doing business can affect the success of PAYG providers and their ability to drive MIM adoption. These include the cost of setting up business, the ease of getting credit and the competitiveness of interest rates, as well as the time associated with moving materials across borders, and strength of the local workforce.

KEY INDICATORS

01

What investment of time and money is associated with importing materials across borders?

Most materials will not be manufactured locally, so this indicator suggests some of the barriers associated with acquiring inventory.

02

What is the cost of setting up a business?

This indicator provides insight into the time and costs to register a local business.

03

What taxes are levied on business profits?

This indicator provides information relevant to long-term viability and growth.

04

What is the capacity of the local workforce?

This indicator provides some insight into how easy it will be to find local workers to support PAYG, including customer service agents, sales agents, and technical staff.

RESOURCES FOR ANSWERS



World Bank Doing Business Index

Ranks world economies according to their ease of doing business, as measured by the conduciveness of the regulatory environment to starting and opening a local firm. The score considers 10 topics, including starting a business, registering property, getting credit, trading across borders, and paying taxes. Scores are available for regional comparison as well as relative to the best overall performing economy for each metric.

Advantages: Comprehensive data set makes for easy comparisons across countries. Useful indicators include time and cost for border compliance when trading across borders, time and cost of registering a new business, and several indicators related to tax payment. Collected annually.

Disadvantages: Indicators are high level and may not reflect the realities of doing business. For example, the “getting credit” indicator measures the depth of credit information available and strength of legal rights of borrowers and lenders, but does not include information on the interest rates of available credit. High interest rates can be a significant barrier to small businesses with high up-front capital costs, such as PAYG solar.



Human Development Reports

The United Nations Development Programme introduced the Human Development Report in 1990 to provide a measure of development that capture multiple dimensions of human capacity, not just economic growth. The Human Development Index includes multiple indicators across 12 dimensions, including health, education, income, inequality, gender, poverty, work, employment and vulnerability, and others. Indicators on education and employment may provide insight into the workforce capacity for off-grid electricity companies.

Advantages: Includes comprehensive group of countries with many years of data. Data are available for download.

Disadvantages: High-level indicators, best suited for relative comparisons.

SECONDARY QUESTIONS

01	Do the banks possess enough liquidity and stability to offer loans to micro, small, and medium enterprises?
02	What are typical interest rates on loans to micro, small, and medium enterprises?
03	Are there solutions available for foreign exchange risk?

LINKS TO RESOURCES

Demographic and Health Surveys. Available at: <http://www.dhsprogram.com/>

mAccess Diagnostic Tool. Available at: <https://www.globalinnovationexchange.org/resources/maccess-diagnostic-tool>

GSMA Intelligence. Available at: <https://www.gsmainelligence.com/>

Living Standards Measurement Study. Available at: <http://econ.worldbank.org/WBSITE/EXTERNAL> <http://econ.worldbank.org/WBSITE/EXTERNAL>

VIIRS Nightlights. Available at: <https://ngdc.noaa.gov/eog/viirs.html>

World Bank open data. Available at: <http://data.worldbank.org/indicator/EG.ELC.ACCS.ZS>

UNEP en.lighten Initiative Country Lighting Assessments. Available at: <http://map.enlighten-initiative.org/>

Global Index. Available at: <http://datatopics.worldbank.org/g20fidata/>

Financial Inclusion Insight Surveys. Available at: http://finclusion.org/data_finder/

IMF Financial Access Surveys. Available at: <http://data.imf.org/?sk=E5DCAB7E-A5CA-4892-A6EA-598B5463A34C>

MIX Finclusion Lab. Available at: <http://finclusionlab.org/analytics>

Finscope. Available at: <https://www.finmark.org.za/what-we-do/financial-inclusion/information-and-research/>

Off-Grid Solar Market Trends Report. Available at: https://data.bloomberglp.com/bnef/sites/4/2016/03/20160303_BNEF_WorldBankIFC_Off-GridSolarReport_.pdf

International Energy Agency. Available at: <http://www.iea.org/statistics/resources/energysubsidies/>

World Bank Doing Business Index. Available at: <http://www.doingbusiness.org/rankings>

Human Development Reports. Available at: <http://hdr.undp.org/en/countries>