



Global Off-Grid Solar Market Report Semi-Annual Sales and Impact Data



July - December 2019, Public Report



COVID-19 and the Off-Grid Solar Industry

The trends and sales figures included in this report refer to the period July–December 2019, and were recorded prior to the outbreak of COVID-19 and the unfolding crisis currently having far-reaching consequences across the globe. This report highlights how the off-grid solar industry is providing energy to over 100 million people around the world, with sales of 4.4 million off-grid solar lighting products and 460,000 off-grid solar appliances in the last six months of 2019 alone. It is a timely reminder that our affiliates are playing a critical role in providing homes and businesses with essential energy services. These services will be even more vital as we respond to the COVID-19 pandemic.

These are unprecedented times but we know that the growing economic crisis will heavily impact the off-grid solar industry. As such, our most immediate goal is to ensure that our industry can continue to provide these services and support its customers. The sector's products are powering mobile phones, TVs and radios, enabling key communications on government announcements and preventative measures; providing clean water through solar water pumps; and keeping the lights on in health clinics. In addition, a number of companies are working directly with health officials to use their distribution networks to rapidly support the COVID-19 response.

Together with other development partners, GOGLA and its partners are working on a number of measures to help the industry navigate this crisis. We are compiling key resources and up-to-date information around the latest responses and measures on the [GOGLA COVID-19 Resource Center](#). We urge governments, investors and the donor community to join us in protecting this vital industry and ensuring its impact is not lost but enhanced in the challenging months ahead.

This report shows that 2019 was a record-breaking year for our sector. It reinforces off-grid solar as a major part of the solution to bring modern energy into off-grid households to power light and appliances in the most remote areas around the world. Over 8.5 million off-grid solar lighting products and 1.2 million off-grid solar appliances were sold in 2019 by a growing number of companies participating in this data collection

In the second half of 2019, we continued to see pay-as-you-go (PAYGo) play an important role as a financing option, enabling customers to access solar products and move up the energy ladder. This is evidenced by the record-breaking 1.19 million sales of PAYGo products in this round, seeing a 19% increase compared to the first half of 2019. This accounts for more than a quarter of total global sales. PAYGo sales contributed to a 22% growth spike registered in the solar home systems (SHS) product category, as well as the swell in the number of multi-light systems sold. East Africa is the biggest contributor to the increase in PAYGo sales volumes, while West and Central Africa show a slower but still significant rate of growth.

While PAYGo continues to grow, the lighting market is still largely driven by cash sales.

Portable lanterns take the lion's share of the cash market with sales surging in East Africa, while large decreases are observed in South Asia, mainly due to the downward trend in India, its largest country market. An interesting trend emerging for cash transactions is the uptake in sales of large SHS of 50+ Wp, which is soaring in East Asia and Pacific.

The increase in SHS sales between July–December 2019 reflects the aspirations of customers who, along with essential lighting, are now increasingly accessing solar-powered appliances

Authors' Note

in their homes and enterprises. Through wider participation from manufacturers and distributors, we now have greater, more valuable insights into the potential of these appliance markets. A number of regions recorded solid growth, with East Africa still representing the lion's share, and West Africa experiencing an impressive surge in demand for appliances. TVs are the most commonly sold appliances by our affiliates, as this mature and energy-efficient technology does not require a large solar panel capacity and can be easily bundled with SHS or up-sold to existing customers. **Although the most popular appliance sold by our affiliates are TVs, it is critical to monitor trends for larger appliances such as refrigeration units and solar water pumps.** These categories will likely experience slower uptake during their earlier stages of innovation and commercial development, but their potential impact through productive use is immense. Strong partnerships between manufacturers and distributors will be critical to foster growth for these products.

Behind each of these sales statistics is a story of social, environmental, and economic impact. It is a testament to the transformative power of off-grid solar that, not only are more households accessing basic energy service, but the quality of their energy access is improving too. **More customers than ever are ascending the energy ladder to access Tier 2 levels of energy, meaning that they are capable of not only turning on lights and charging their phones, but also of powering energy-efficient**

appliances. GOGLA's revised impact metrics, used to create the impact estimates shared in this report, show with even greater clarity, what this new or improved quality of energy service means for an off-grid household.

GOGLA, Lighting Global and Efficiency for Access Coalition remain committed to achieving Sustainable Development Goal 7 and ensuring that off-grid solar continues to boost the health, well-being, and economic opportunities of millions of people around the globe. The next edition of this report, expected in October 2020, should offer an indication of how our industry has been affected by the COVID-19 pandemic. Despite the challenging times ahead, the demand for sustainable and reliable electricity will remain high. **As such, we call on policy-makers, investors and governments to recognise the impact of the data highlighted in this report by further supporting the sector, and continuing to build a sustainable, resilient future with our industry.**

Sincerely,

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About the Report

Authors

GOGLA

GOGLA is the global association for the off-grid solar energy industry. Established in 2012, GOGLA now represents over 180 members as a neutral, independent, not-for-profit industry association. Its mission is to help its members build sustainable markets, delivering quality, affordable products and services to as many households, businesses and communities as possible across the developing world. The products and solutions that GOGLA members sell transform lives. They improve health and education, create jobs and income opportunities and help consumers save money. [To find out more, go to www.gogla.org.](http://www.gogla.org)

Lighting Global

Lighting Global is the World Bank Group's initiative to rapidly increase access to off-grid solar energy for the 840 million people worldwide living without electricity. Lighting Global – managed by the International Finance Corporation (IFC) and the World Bank – works with manufacturers, distributors, governments, and other development partners to build and grow the modern off-grid solar energy market. Lighting Global programs are funded with support from the Energy Sector Management Assistant Program (ESMAP), The Public – Private Infrastructure Advisory Facility (PPIAF), The Netherlands' Ministry of Foreign Affairs, The Italian Ministry for the Environment, Land, and Sea (IMELS), and the IKEA Foundation.

[For more information, please visit www.lightingglobal.org.](http://www.lightingglobal.org)

Efficiency for Access Coalition

Efficiency for Access is a global coalition working to promote high performing appliances that enable access to clean energy for the world's poorest people. It is a catalyst for change, accelerating the growth of off-grid appliance markets to boost incomes, reduce carbon emissions, improve quality of life and support sustainable development. Current Efficiency for Access Coalition members have programmes and initiatives spanning three continents, 44 countries, and 22 technologies. [For more information, please visit www.efficiencyforaccess.org.](http://www.efficiencyforaccess.org)

The appliances section of this report has been funded by UK aid from the UK government. However, the views expressed do not necessarily reflect the UK government's official policies.

Berenschot

Berenschot is a leading Dutch management consultancy firm with an extensive track record in supporting industry associations on market data collection. Berenschot has been elected by clients as one of the best management consultancy firms of the Netherlands. Berenschot maintains a high standard of confidentiality, as stated in the Berenschot Terms and Conditions.



About the Report

Participating Companies

#	Company Name	Off-Grid Solar Lighting	Off-Grid Solar Appliances
1	A4&T Power Solutions Limited	MAN	-
2	Agsol	-	MAN
3	Alternative Energy Technologies Group		DIS
4	Al Qaria Solar		DIS
5	ARESS Sarl	DIS	MAN & DIS
6	Azimuth		DIS
7	Azuri Technologies		MAN
8	Baobab+		DIS
9	Barefoot Power Africa		MAN
10	Basil Energetics	-	MAN
11	BBOXX		MAN
12	Beebeejump Technology		MAN
13	Bengal Renewable Energy		MAN
14	BioLite	MAN	-
15	Bonergie	DIS	MAN
16	Bright Life by Finca	DIS	-
17	Bright Products AS	MAN	-
18	CLOUD ENERGY PHOTOELECTRIC		MAN
19	Coolfinity	-	MAN
20	Cygni Energy	MAN	MAN & DIS
21	d.light		MAN
22	Dassy Enterprise	DIS	MAN & DIS
23	Deevabits Green Energy	DIS	-
24	Devidayal Solar Solutions	-	MAN
25	DGridEnergy		MAN
26	Dulas	-	MAN
27	EcoEnergy		DIS
28	Ecozen Solutions	-	MAN
29	EnerGen WAO		DIS
30	Ennos	-	MAN
31	Fenix International		MAN
32	Fosera		MAN
33	Futurepump	-	MAN
34	General Fan Company (GFC)	-	MAN
35	GLOBAL ICE TEC	-	MAN
36	Greenlight Planet	MAN	MAN & DIS
37	Jua Energy	MAN	-
38	KickStart International	-	MAN
39	Lagazel	MAN	-
40	Little Sun	MAN	-
41	Lumos Global	MAN	-
42	M-KOPA		MAN
43	Mibawa Suppliers		MAN
44	Micergy		MAN
45	Mobisol	MAN	MAN & DIS
46	Moon		MAN
47	Mwezi Limited		DIS
48	Nadj-Bi		MAN
49	Namene Solar Light	MAN	-
50	National Solar Power Authority (NASPA)	DIS	-
51	Niwa		MAN
52	Offgrid Sun		MAN
53	OmniVoltaic Energy Solutions		MAN
54	Oolu Solar	DIS	MAN
55	Orb Energy	MAN	-

#	Company Name	Off-Grid Solar Lighting	Off-Grid Solar Appliances
56	OvSolar		MAN
57	Pawame	DIS	-
58	PEG Africa	DIS	MAN & DIS
59	Plug The Sun	MAN	DIS
60	Poly Solar Technologies		MAN
61	Qingdao LEFF International Trading		MAN
62	Qotto		MAN
63	Rahimafrooz Renewable Energy		MAN
64	RAL Consumer Products		MAN
65	RDG Collective		MAN
66	Renewit Solar		MAN
67	SELCO	MAN	MAN & DIS
68	Shanghai Easy Renewable Energy	MAN	-
69	Shenzhen JCN New Energy Technology	MAN	-
70	Shenzhen LEMI Technology Development		MAN
71	Shenzhen Power Solutions		MAN
72	Shenzhen Solar Run Energy		MAN
73	Shenzhen Sun's Energy		MAN
74	Sherpa Power Engineering	MAN	-
75	Signify Innovations	MAN	-
76	Simpa Energy		MAN
77	Simusolar	-	MAN & DIS
78	Sinoware Technology	MAN	-
79	Smarter Grid International		MAN
80	Solar Panda		MAN
81	Solar Village	MAN	MAN & DIS
82	Solar Sister	DIS	-
83	SolarHome		DIS
84	Solaris Tanzania		DIS
85	SolarNow	MAN	MAN & DIS
86	SolarWorks!		DIS
87	Solartechno Europe	MAN	-
88	Solibrium Solar		DIS
89	Steca	-	MAN
90	SUNami Solar	MAN	MAN & DIS
91	SunCulture		MAN
92	Sunlite (India Impex)	MAN	-
93	Sunny Irrigation	-	DIS
94	Sunny Money (Solar Aid)	DIS	-
95	Super Star Renewable Energy (SSG Solar)		MAN
96	Tamoor Fan Company	-	MAN
97	Total	DIS	
98	UI Industries (Starco Fans)	-	MAN
99	UpOwa	DIS	-
100	Village Boom	MAN	-
101	Village Power	MAN	DIS
102	Vitalite Zambia		DIS
103	Vitalite Senegal		DIS
104	Youmma Solar	-	MAN
105	Zola Electric (former Off-Grid Electric)	MAN	MAN & DIS
106	Zonful Energy	DIS	MAN & DIS
107	Zuwa Energy		DIS

NOTE:

Companies are classified as either distributors (DIS) of other companies' branded products, or as manufacturers (MAN) if they are selling their own-brand products. For the Off-Grid Solar Appliances category, there may be companies classified as both manufacturers and distributors, as companies often sell both their own branded appliances, while also distributing other companies' products.

Methodology Sales Data Collection

Scope

Eligible Products

The off-grid solar sector has brought access to light and modern energy into homes for over a decade. Since then, the sector has become a key part of electrification strategies around the world, offering clean, reliable energy access to the most remote households. In addition to the essential lighting access, off-grid solar now powers a growing selection of appliances. **To accurately reflect this, this report presents sales data for two separate product segments.**

- 1. Off-Grid Solar Lighting Products,** Systems that include a solar panel, a battery and at least one light point. Products which are sold as components such as individual panels, lights, batteries or mobile phone chargers are not included.
- 2. Off-Grid Solar Appliances,** A range of energy-efficient electrical appliances appropriate for both off-grid or weak-grid areas,¹ where low-capacity power systems are not suitable for use of conventional appliances. These devices are typically compatible with a DC-powered system and are usually more energy efficient than traditional counterparts. This report focuses on TVs, fans, refrigeration units, and solar water pumps. Only solar-powered appliances are accounted for. Scope is further narrowed to focus on those appliances most suitable for purchase by individual customers on a household or micro-enterprise level. In the case of solar water pumps, this means they must be less than 3 kW and solar-powered, while for refrigeration, large commercial scale walk-in units are not considered.

The methodology detailed in the following paragraphs was applied to sales data for both off-grid solar lighting products and appliances. Currently, data for these two sections is collected separately, meaning that there is no distinction between appliances sold in a bundle with a solar home system or sold standalone. In future rounds, efforts will be made to link these segments and better identify key connections and trends.

Eligible Companies

This report solely includes data on products sold by affiliates. Affiliates are companies connected to the partner organisations involved in the reporting process. Companies include GOGLA members, companies selling products that meet Lighting Global Quality Standards, and appliance companies that participated in the Global LEAP Awards or are engaging with the Low Energy Inclusive Appliances (LEIA) programme.

Out of a pool of 225 eligible companies, 107 participated in this round and reported sales covering the period July-December 2019. Out of these 66 sell both off-grid solar lighting products and appliances, as shown in Figure 1.

Figure 1 - Breakdown of Companies per Segment



¹ "Off-grid" refers to populations that live beyond the reach of the national grid; "weak-grid" refers to populations that have unreliable grid connectivity and suffer frequent and sometimes lengthy outages.

Methodology Sales Data Collection

Market Share Represented

For Off-Grid Solar Appliances, the proportion of the total market that is represented by our affiliates has not yet been estimated. This is partly due to insufficient data on the total size and number of players in this market. Continuous efforts are made to estimate such coverage as well as ongoing efforts to engage a larger number of companies in upcoming rounds.

For Off-Grid Solar Lighting Products, based on the recently completed analysis for the '2020 Global Off-Grid Solar Market Trends Report', it is estimated that in 2018 sales of affiliates represent over 50% of the market for plug-and-play solar home systems. Although, when including portable lanterns and multi-light systems, the percentage of affiliates in 2018 goes down to 28%, as non-affiliate products are particularly dominant in those two pico segments. It is estimated that 72% of the overall global market consists of sales from approximately 200 non-affiliate manufacturers. These market share percentages vary dramatically from country to country, as demonstrated in Table 2.

Table 2 – Market share estimates of affiliate and non-affiliates manufacturers for both Pico & SHS²

Country	Affiliates	Non-Affiliates
Global	28 %	72 %
Rwanda	97 %	3 %
Zambia	68 %	32 %
Kenya	54 %	46 %
Cambodia	47 %	53 %
Nigeria	33 %	67 %
Ethiopia	29 %	71 %
India	25 %	75 %
Uganda	22 %	78 %
Niger	14 %	86 %
Togo	7 %	93 %
Myanmar	5 %	95 %

NOTE:

The global market share is calculated using a weighted average of non-affiliate market share for 12 countries.

Countries and Regions

The regional groupings in this report follow those outlined by the World Bank country and lending groups³. Sub-regional groupings in Sub-Saharan Africa follow the United Nations' categorisation of geographical sub-regions⁴.

Sales data is represented in this report for all countries in which at least three companies reported sales. For off-grid solar lighting products, this amounted to 42 countries while, for off-grid solar appliances, 28 country market sales are reported for all appliances combined. More country breakdowns are offered for TVs (15 countries) and fans (10 countries), while for less established technologies such as refrigeration units and solar water pumps, only three countries each will be shown due to insufficient data.

Data Collection

Partner Organizations

In line with previous reports, data collection and affiliate reporting was overseen by Berenschot, a Dutch management consultancy firm. Specialised industry knowledge and insight was provided by a research team, consisting of GOGLA, Lighting Global, Energy Saving Trust, and CLASP. The online questionnaire and results platform were programmed by Outfox, a Dutch web development company.

Data Collection Process

This data collection process takes place semi-annually, collecting sales information for the January-June period and the July-December months of a given year. Affiliates are requested to provide their product and country-level sales through an online questionnaire in a three-week period every January and July. Great effort is made to ensure maximum participation, with GOGLA offering one-on-one support to companies throughout the reporting process. The data is then monitored for accuracy, aggregated with strict confidentiality rules and analysed to compile the Global Off-Grid Solar Market Report.

2 Adapted from: Lighting Global, Vivid Economics and Open Capital Advisors, 2020 Global Off-Grid Solar Market Trends Report, 2020. Full report here: <https://www.gogla.org/resources/2020-off-grid-solar-market-trends-report>

3 For more information, please visit: <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>.

4 For more information, please visit: <http://unstats.un.org/unsd/methods/m49/m49regin.htm#africa>.

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Results Visualization

Each participating company receives access to a recently enhanced and improved online platform that provides each company with a dashboard to view and download the consolidated sales figures for all affiliates and their own performance since 2016. The interactive platform illustrates the market share in all geographies and product segments for which they have reported sales. We are confident that this information strengthens the companies' strategic decisions by providing an understanding of their relative position in markets and the competitive trends in the sector.

Accuracy

All data in this report is self-reported by the companies. Although it is cross-checked for consistency, **the companies are ultimately responsible for accurate reporting** of product specifications, pricing information, sales volumes and locations of sales. **It is also important to note that companies may choose to report sales volumes but not pricing information used to estimate the market value of such products.**

Data Checks

The research team monitored the reported data for consistency and logic with respect to previous data records. Based on these checks, some small adjustments have been made concerning product performance specifications and the 'quality verified' status of products where necessary. Companies were contacted, prior to publication, in any instances where changes to their data were required.

Data Aggregation and Segmentation Definition of Manufacturers/Distributors to Avoid Double-counting Sales

Companies are classified as distributors when they are selling other companies' branded products, or as manufacturers when they are selling their own-brand products. Only data compiled from companies categorised as manufacturers is presented here to avoid any duplicate figures.

For Off-Grid Solar Lighting Products, companies are classified as either manufacturers or distributors (see Table 1). For Off-Grid Solar Appliances, it was necessary for any information provided to be classified by product. This means

there may be companies classified as both manufacturers and distributors (see Table 1). This is a necessary allowance, because companies in this segment often sell both their own branded appliances while also distributing other companies' products.

Confidentiality and the Three-data Point Rule

Data on a specific region, country or product category is only included when it has satisfied the three-data point rule. This means that at least three separate product manufacturers need to have reported sales for any single data point to be reflected in the figures throughout the report. Where there are fewer than three responses for a region, country or product category, no results are shown to protect the proprietary interests of the companies who have supplied data in support of this industry report. This is signaled by an empty bar next to the name of the region, country or product category. To differentiate, if there are no companies reporting data, the graph shows a '0'.

Distinction between Cash and PAYGo Sales Sales are split into two categories

based on whether the products are sold to a customer:

- As a **cash sale**, in a single transaction to the customer. Note that this category also typically includes products purchased as a tender by governments and humanitarian agencies.
- On a **Pay-as-you-go (PAYGo) basis**, where the customer pays for the product in instalments over time or pays for use of the product as a service. This includes products sold by distributed energy service companies (DESCOs) and microfinance institutions (MFIs), as well as those sold as lease-to-own.

Following the confidentiality rule, the split in sales volumes is shown for any single data point where at least three separate manufacturers have reported data for both cash and PAYGo products. Otherwise, when only one of the two payment categories passes this confidentiality rule, only the combined total is shown.

Computations

For both off-grid solar appliances and lighting products, the **sales volumes (in units)** are given by the sum of all the products sold by companies

Methodology Sales Data Collection

classified as manufacturers (products sold by distributors are not included to avoid double-counting as noted above). These volumes are further segmented in region/countries, in cash/PAYGo, and in product categories shown in the following section.

Only for the off-grid solar lighting products, the report presents the **newly installed capacity (in MW)**; this represents the total peak power output of solar panels deployed during this reporting round. This metric provides further insight and enables calculation of the average size of systems sold in a region or country.

Another indicator presented in this report is the **market value of the products (in USD)**, currently reported only for off-grid solar lighting products. In future rounds of data collection, the research team will evaluate the best methodology to measure the market value of off-grid solar appliances.

Given the difference in the nature of cash and PAYGo segments, two different proxies are used to compute their market value; therefore, the total value of all the products sold in each round cannot be calculated by combining the two values reported.

- a. **The value of cash products** is determined by multiplying the sales volume by a wholesale per unit price reported by the product manufacturer and a multiplying factor to estimate the costs incurred in getting the product to customers. This includes transport, duties, taxes, clearance costs, sales channel overhead, and markups. **The wholesale Free-on-board (FOB) price** is defined as the United States dollar (USD) per unit price for a 1,000-unit minimum order quantity, at the point of supply.
- b. Using the FOB price as a proxy for the value of PAYGo products would not be accurate because the time frame of payment is projected to the future in line with the business model, allowing customers to pay for their products over several months or years. **The value of PAYGo products sold** is calculated here by multiplying the sales volumes by the

Estimated Total Cost of Ownership (TCO) in USD reported by the PAYGo company and applying a standard estimated loss rate to account for cases where customers do not pay back for the product in full (e.g. products lost or destroyed or customer default). The TCO represents the average amount received from a customer repaying the product in full and on time, including deposit payment and all regular daily, weekly, or monthly payments, without applying a financial discount rate to this value.

Product Categorisation

Off-Grid Solar Lighting Products

This segment consists of systems that include a solar panel, a battery and at least one light source. This means that products sold as components such as individual panels, lights, batteries or mobile phone chargers, are not included.

Data has been grouped into product categories to present sales in a segmented manner that provides the most value and information to the market.

The categories of all products with less than 11 Wp solar module capacity are determined by the services provided by the product in question. An example of this would be the number of light points and the possibility of mobile charging. Each of these categories is represented by an indicative wattage range of PV modules that is typical for most products providing these services. **Panel wattage in watt-peak (Wp) is used to categorise off-grid solar lighting products with solar modules of 11 Wp and above.** The definitions of these categories are presented in Table 3.

The level of energy access these off-grid solar lighting products provide is shown using the multi-tier framework for measuring energy access. This framework was developed by the World Bank's Energy Sector Management Assistance Program (ESMAP)⁵ under the Sustainable Energy for All initiative.

⁵ Energy Sector Management Assistance program of the World Bank group (ESMAP), Beyond Connections: Energy Access Redefined, 2015. Full report here <https://www.esmap.org/node/55526>

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Table 3 – Product Categories – Off-Grid Solar Lighting Products

Overall category	Solar module capacity, Watt Peak (Wp)	Categorization by services provided by product	Corresponding level of Multi-Tier Framework energy access enabled by use of product
 Portable Lanterns	0 – 1.499 Wp (indicative)	Single Light only	Enables partial Tier 1 Electricity Access to an individual person
	1.5 – 2.999 Wp (indicative)	Single Light & Mobile Charging	Enables full Tier 1 Electricity Access to at least one person and contributes to a full household
 Multi-light Systems	3 – 10.999 Wp (indicative)	Multiple Light & Mobile Charging	Enables full Tier 1 Electricity Access to at least one person up to a full household
 Solar Home Systems	11 – 20.999 Wp	SHS, Entry Level (3–4 lights, phone charging, powering radio, fan etc.)	Enables full Tier 1 Electricity Access to a household
	21 – 49.999 Wp	SHS, Basic capacity (as above plus power for TV, additional lights, appliances & extended capacity)	Enables full Tier 2 Electricity Access to a household when coupled with high-efficiency appliances
	50 – 99.999 Wp	SHS, Medium capacity (as above but with extended capacities)	Enables full Tier 2 Electricity Access to a household even using conventional appliances
	100 Wp +	SHS, Higher capacity (as above but with extended capacities)	

Off-Grid Solar Appliances

This report features a range of off-grid solar appliances; TVs, fans, refrigeration units and solar water pumps, sold to targeted customers living in off-grid or weak-grid areas. At this early stage of data collection for appliances, just a small subset of all available appliances are considered, as only solar-powered appliances are accounted for. Our scope is further narrowed to focus on appliances most suitable for purchase by individual customers on a household or micro-enterprise level. In the case of solar water pumps, they must be less than 3 kW and solar-powered, while for refrigeration, large commercial scale walk-in units are not considered.

Companies and sector experts assessed how best to categorise and present the findings in this report to offer the greatest possible clarity for each appliance type and their sub-categories. The Global LEAP Awards’ categorisation for refrigerators and solar water pumps was adopted,

as it was designed to recognise high standards of technical performance, energy efficiency, and innovation specifically for off-grid appropriate appliances. Using this product categorisation means the data in this report is presented as clearly and consistently as possible. In future rounds, there may be a review of the solar water pumps categorisation and the terminology of the refrigeration units section, due to the continued growth and evolution in these appliance areas.

Two of four appliance types were segmented not only by their size (e.g. the diameter in inches for the fans), but also by the type of products (e.g. table fans vs. ceiling fans). **The categorisation in Table 4 was adopted as a way of future-proofing** and we accept that for now, most of these single categories will not be shown, as the three data point rule hides all data points where less than three responses have been collected.

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Table 4 - Product Categories – Off-Grid Solar Appliances

Appliance Type	Categorization (in orange) and definition (in blue bold)	
	TVs Screen Size (diagonal, inches)	
	Small 12-17"	
	Medium 18-23"	
	Large 24-29"	
	Extra large 30+"	
	Fans Diameter (inches)	
	Table Fan A smaller-diameter propeller-bladed fan having two or more blades and intended for use with free inlet and outlet of air. It may be a table fan or bracket-mounted fan for wall or ceiling mounting.	
	Small <12"	
	Large 12+"	
	Pedestal Fan A propeller-bladed fan having two or more blades mounted on a pedestal of fixed or variable height and intended for use with free inlet and outlet of air.	
	Ceiling Fan A propeller-bladed fan having two or more blades and provided with a device for suspension from the ceiling of a room so that the blades rotate in a horizontal plane.	
	Small <48"	
	Large 48+"	
		Refrigeration Units Size (litres)
		Refrigerator One or more fresh food compartments for the storage and preservation of unfrozen food and beverages.
Small 5-50 L		
Medium 51-100 L		
Large 101+ L		
Refrigerator-Freezer Combination Unit At least one fresh food compartment and at least one freezer compartment		
Small 5-100 L		
Medium 101-150 L		
Large 151-200+ L		
Extra Large 201+ L		
Multi-temperature Refrigerator One or more compartments that can be operated either as a refrigerator or freezer by adjusting the thermostat control.		
	Solar Water Pumps No breakdown was possible due to limited variety of data reported	



Off-Grid Solar Lighting Products



Behind the numbers

Background

The Global Off-Grid Solar Market data collection for portable lanterns, multi-light systems and solar home systems (SHS) has seen profound changes since it was launched in 2010 by Lighting Global. The World Bank Group's Initiative deserves to be recognised for establishing this crucial data gathering exercise. GOGLA became part of this process in 2014 and, since 2016, has acted as the lead coordinator on the reporting.

The number of countries included in the data gathering process and analysis has grown rapidly. Initially companies reported data only for countries in which Lighting Global and affiliated programs were active, but since 2014 all countries recognized by the UN have been included. Similarly, the number of companies involved has dramatically increased, from a handful of active players at the early stages of the process, to over a 100 companies sharing their data in this latest round. The report has evolved from solely reporting sales units, to include an estimate of the impact generated by the sales using the formulation of the GOGLA 'Standardised Impact Metrics for the Off-Grid Solar Energy Sector'. These metrics are continuously revised to offer more detailed and nuanced insights on what improved energy access means for an off-grid household.

This report is constantly evolving, offering a snapshot of our diverse and dynamic industry, working across many countries. We welcome any suggestions or recommendations to improve it in order to better support our industry to contribute to the achievement of Sustainable Development Goal 7: affordable, reliable, sustainable and modern energy access for all.

Market Drivers

The data presented in this report is influenced by external factors and market drivers. Where possible, to add context to the reported sales volumes, we have included an explanation of the key market drivers relevant to the data. These include:

- Policy changes affecting duties, taxes, and the regulation of the off-grid solar sector.
- Actions and initiatives by development finance institutions, donor agencies and government market interventions.
- Developments in technology and increased competition on price.

- Availability of finance, in particular working capital and local currency financing.
- Macroeconomic factors, including general economic conditions, currency fluctuations, and other factors affecting the purchasing power of customers. One such example is the current COVID-19 crisis, which did not affect the results shown in this report for the pre-crisis half year but which is now having far-reaching impacts on global markets, sectors and industries.
- Seasonal spending patterns and trends, as well as climate and other environmental factors.
- Competitive dynamics by non-affiliate companies on which we do not have great visibility.

Generally, **increases and decreases in sales are investigated by the research team to find a plausible explanation for the change in reported volumes.** For example, when Malawi presented unusually high sales volumes in the second half of 2017, the team was able to trace them back to bulk purchases by local organisations. By nature such procurements are not recurring, therefore fluctuations are expected round on round.

However, it is not always possible to find a solid explanation. This is because the market is complex, shifting and, in many instances, market drivers overlap or have interactions with neighbouring sectors, which are not always apparent. Moreover, sales reported by companies are spread across both business-to-business (B2B) and business-to-customer (B2C) markets. For B2B sales, products are sold to distributors, governments or any other intermediary body before they reach their intended end-user; consequently market drivers affecting customer demand may only begin to manifest when the products are being distributed. On the other hand, B2B sales are more affected by import-related market drivers.

Changes in reported sales may be driven by the performance of a specific company in countries where it operates. In these cases, it cannot be explicitly referenced in the report in order to comply with confidentiality rules.

Off-Grid Solar Lighting Highlights

Key Figures

Sales refer to all off-grid solar lighting product sales reported by participating affiliates in the period between July 1st and December 31st, 2019.

Global Sales Highlights

4.42 million
off-grid solar lighting products sold globally

3.23 million
have been sold as cash products

1.19 million
sold via Pay-As-You-Go (PAYGo)



 <p>2.81 million solar lanterns sold globally</p>	 <p>780,000 multi-light systems sold globally</p>	 <p>830,000 SHS sold globally</p>	<p>53.24 MW newly installed capacity globally through the off-grid solar lighting products</p>
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Regional Sales Highlights for Off-grid Solar Lighting Products

<p>2.43 million products sold in East Africa East African</p>	<p>370,000 products sold in West African</p>	<p>120,000 products sold in Central African</p>
<p>840,000 products sold in South Asian</p>	<p>250,000 products sold in East Asian and Pacific</p>	<p>210,000 products sold in Middle Eastern and North African</p>
<p>80,000 products sold in Latin America and Caribbean</p>	<p>20,000 products sold in Southern Africa</p>	

Off-Grid Solar Lighting Highlights

Impact estimates relate to all off-grid solar lighting product sales reported to date by participating affiliates⁶ (as of December 2019).

313 million

number of people who have ever lived in a household with improved energy access⁷ as a direct result of off-grid solar lighting products sold since July 2010



107 million

people currently living in a household with improved energy access

63 million

people currently accessing Tier 1 energy services, based on the Sustainable Energy for All Global Tracking Framework

10.4 million

people currently accessing Tier 2 energy services, based on the Sustainable Energy for All Global Tracking Framework

2.7 million

people currently using their off-grid solar lighting products to support an enterprise - such as charging phones for a fee or operating a bar, restaurant, shop or stall after daylight hours



\$5.7 billion

additional income generated as a result of system ownership, over the expected lifetime of all off-grid solar lighting products sold since July 2010



\$11 billion

savings on energy expenditure, over the expected lifetimes of all portable lanterns or multi-light systems sold since July 2010

74 million

metric tonnes of carbon dioxide and black carbon emissions avoided (in CO₂e), over the expected lifetime of all off-grid solar lighting products sold since July 2010



NOTE:

The expected lifetime of products is calculated using the GOGLA 'Standardised Impact Metrics for the Off-Grid Solar Energy Sector', and is based on an average of one and a half times the manufacturer's warranty. **For further details on the impact created, please refer to the "Impact Metrics" section on page 64.**

⁶ Affiliates include GOGLA members, companies selling products that meet Lighting Global Quality Standards, and appliance companies that participated in the Global LEAP Energy Efficient Appliance Awards or are engaging with the Low Energy Inclusive Appliances (LEIA) programme

⁷ In this context, 'improved' is used to reflect lighting and energy provided by appropriate (less expensive, less harmful, better quality) technologies such as solar, instead of baseline technologies such as kerosene lanterns, battery lights, candles, or even poor-quality generic solar products etc.

Global Market Insights

Global sales for this reporting round topped the first half of 2019 to reach 4.42 million units sold. This represents a newly installed capacity of 53.24 megawatts. **All in all, 2019 was a record year for off-grid solar sales, totaling over 8.5 million units.**

As we have seen in previous reports, a large majority of these units are cash sales, as shown in Figure 2. **Cash sales accounted for 3.23 million units - 74% of the total market share - with a value of \$98 million in the second half of 2019.** These cash sales are typically smaller products sold in a single transaction. We are seeing an increase in cash sales of large solar home systems with panel capacity 50+ Wp, particularly in East Asia and Pacific. This drove the increase in the market value of cash sales visible in Figure 3.

PAYGo continues to break records and has reached sales of 1.19 million units - 27% of global volumes with a market value of \$165 million. The market value of reported PAYGo products is the amount received once the product has been paid in full by the customer; since the products are paid over multiple installments over a number months, there are a variety of factors which can lead to the full value of the sale not materialising. This variability around repayment in full is embedded in the pricing of products, which is different to the cash price of the product. In Figure 3, we see that the PAYGo value is lower than the previous reporting round, even with increasing volumes of PAYGo products. This appears to be largely driven by the following: 1) Companies are reporting lower total costs of ownership (TCOs) for SHS

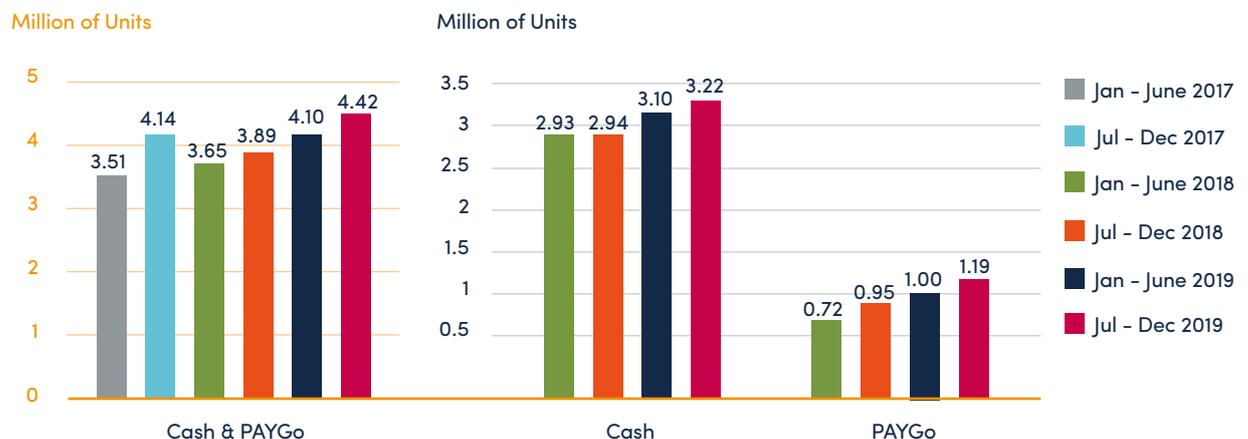
with wattage 21-49 Wp, 2) An increasing amount of lanterns with mobile charging sold via PAYGo which have lower TCOs and finally, 3) An overall decrease of PAYGo sales of SHS with wattage 50-100 Wp and 100+ Wp. The first reason is likely a result of increased competition in countries or a decrease in technology costs which push companies to reduce the price for customers.

Globally, sales volumes saw an increase of 8% - with systems sold on cash seeing a 4% boost and PAYGo up 19% compared to the first half of 2019. The total increase in MW capacity stands at 30% compared to the last reporting round. The significant increase in newly installed MW capacity is a result of sales of larger off-grid solar products, which naturally contribute more to the amount of MW installed than smaller products. In effect, the 8% increase in volume of units sold led to an overall 30% increase in installed capacity because of the high volume of large products sold.

The sum of 2019's sales data shows a significant 13% increase compared to the annual sales of both 2018 and 2017, which both registered around 7.6 million units. This sales peak was due to the strong growth trajectory of sales in Sub-Saharan Africa, counteracting the decrease of sales in South Asia.

The following paragraphs will elaborate on the specific product category trends that culminated in these global insights. For further insights into the regions affecting these global trends, please refer to the Regional Market Insights section on page 24.

Figure 2 - Semi-annual Evolution of Volume of Products Sold Globally

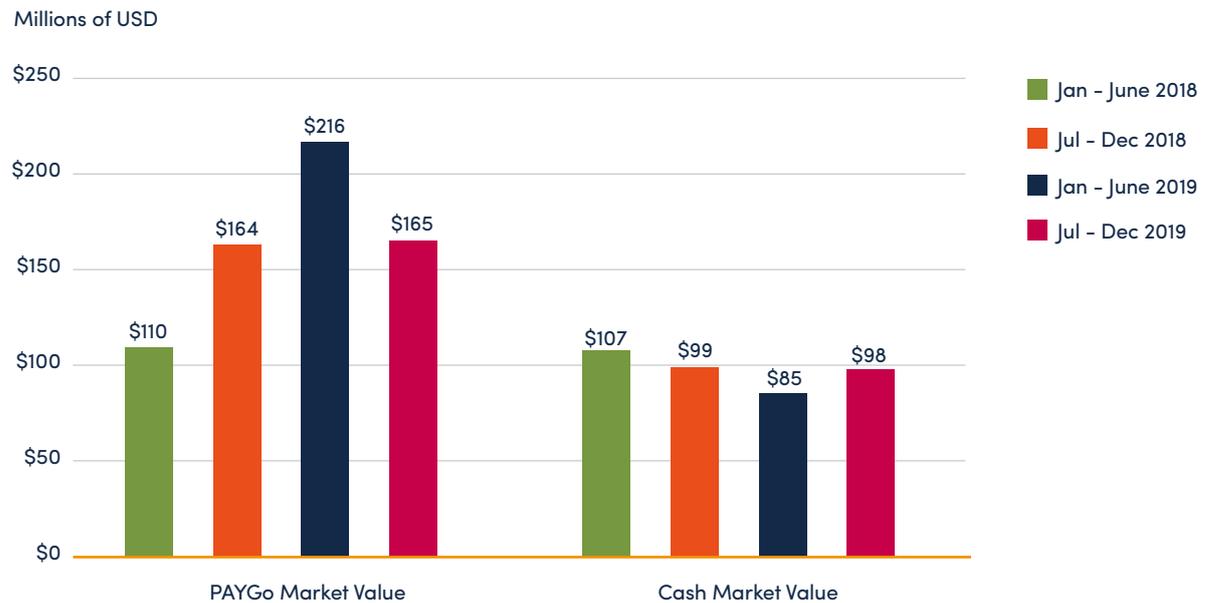


NOTE:

Products are classified as "Cash" when sold in a single transaction (typically including products purchased via tenders), or as "PAYGo", when the customer pays for the product in instalments over time or pays for use of the product as a service.

Global Market Insights

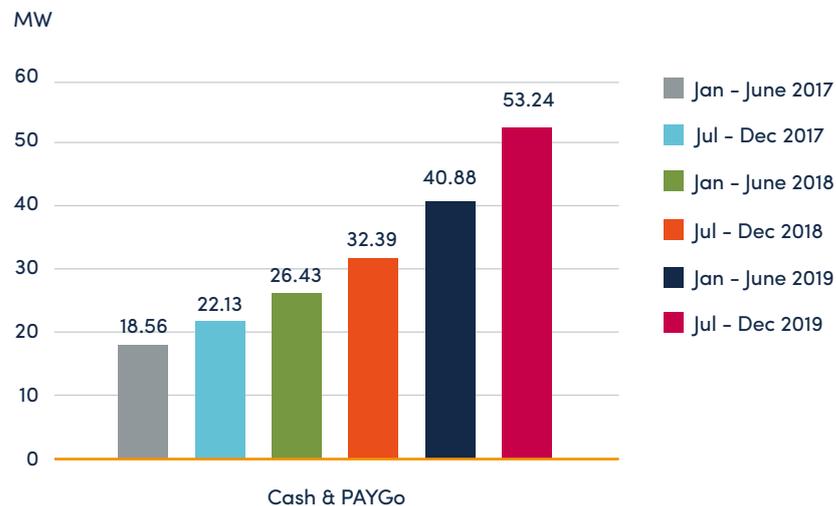
Figure 3 - Semi-annual Evolution of Global Value of Products Sold



NOTE:

The market value for cash sales and PAYGO has not been aggregated as it is computed through two very different approaches. The Cash Market Value is calculated using the reported FOB price, while for PAYGo products the Total Cost of Ownership is used.

Figure 4 - Semi-annual Evolution of Global Newly Installed Capacity



NOTE:

The newly installed capacity should be regarded as the solar capacity in MW during the reporting round, using the reported panel size per product, and not as a cumulative number over time.

Global Market Insights



Portable Lanterns

The second half of 2019 saw 2.81 million portable lanterns sold globally, representing 64% of all sales worldwide.

Portable lanterns capable of charging mobile phones - i.e. those with an indicative wattage of 1.5-2.999 Wp - **were a bestseller in terms of volumes across all product categories, with 1.48 million recorded sales.** The majority of these were sold on a cash basis. However, an increasing amount of portable lanterns with mobile charging capabilities were sold through PAYGo channels, rising from 9% in the first half of 2019 to 14% in this reporting round; this could be an indication that PAYGo is increasingly enabling access to smaller categories as well for less well-off customers. This category makes up 33% of all sales, with a cash value of \$31.45 million and reported PAYGo value of \$4.58 million with newly installed capacity reaching 4.83 MW.

Portable lanterns without mobile charging - i.e. those with an indicative wattage of 0-1.499 Wp - **were the second-best performing category in terms of sales volumes, with 1.3 million units sold.** These lanterns represent 30% of the total sales volumes for lighting products globally, with a cash value of \$8.14 million, a relatively small dollar value due to the low retail price which keeps products affordable and price competitive. The total newly-installed capacity for these lanterns stands at 0.51 MW.

The evolution in Figure 5 shows the **overall stability of sales for portable lanterns with only a few percentage points deviation from the numbers of the first half 2019.** However, in the coming sections we will dive into very different regional trends that are behind this overall stability.



Multi-light Systems

Sales of multi-light systems rose in the second half of 2019, reaching 780,000 units sold and representing 18% of the global sales total. A 30% increase was recorded in this product category compared to the first half of 2019.

PAYGo sales now account for 56% of multi-light systems sales, leaping up from 43% in the first half of 2019. This indicates the growing importance of the product financing business model, even in the smaller product categories. Customers benefit from PAYGo as a means of moving up the energy ladder and accessing larger, more expensive off-grid products that many rural customers would be unable to afford in a single upfront payment.

The total newly installed capacity for multi-light systems stands at 5.17 MW. The total cash value of these newly installed systems is \$13.42million, and \$44.36 million for PAYGo.



Solar Home Systems (SHS)

SHS - consisting of larger, higher-cost products of wattage 11+ Wp - **recorded sales of 830,000 units up from 680,000 in the previous reporting round.** These sales accounted for 19% of all sales worldwide in the second half of 2019. Total newly installed capacity for SHS stands at 47.90 MW.

SHS sales saw an overall 22% increase, continuing the trend of strong growth reported in previous rounds. Increases in sales in this product category are driven by greater affordability due to PAYGo and increasing customer demand for appliances - including TVs, fans, refrigeration units and solar water pumps and is further explored in the appliances section of this report.

Global Market Insights

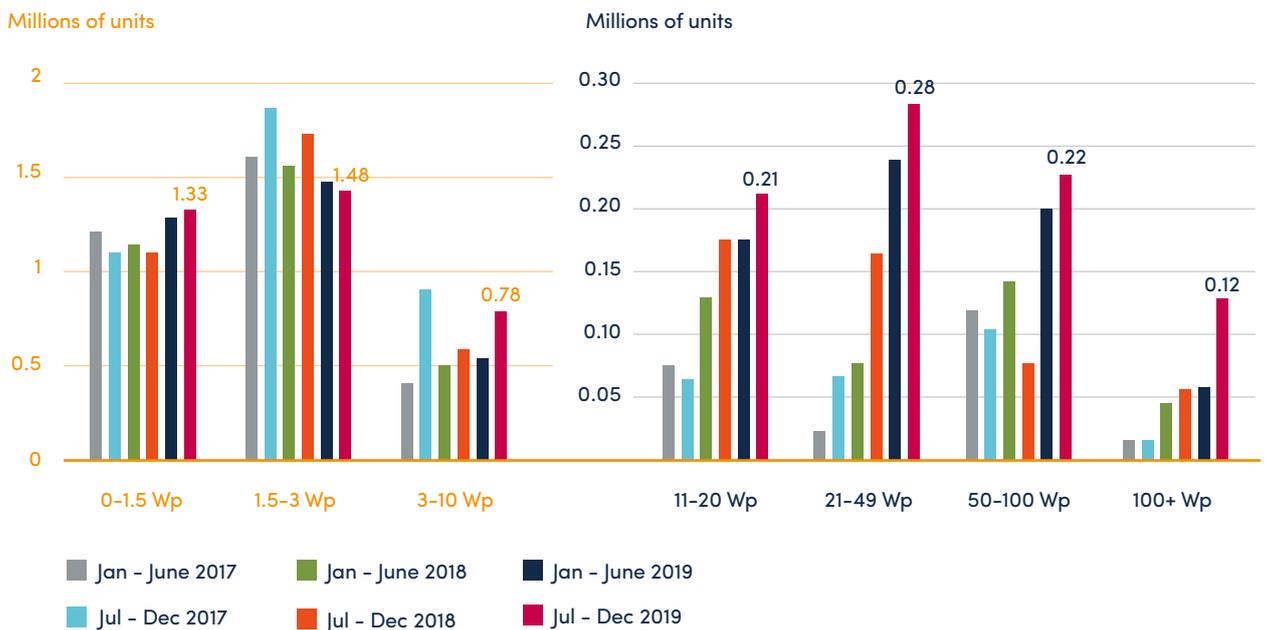
Approximately 65% of all SHS are sold through PAYGo financing. Although the larger 100+ Wp systems see smaller volumes sold on a PAYGo basis with just 21% sold through the PAYGo platform and the majority of larger SHS sold as single cash transactions. It's possible that these larger, more expensive products are sold as back-up systems for relatively affluent customers with grid connection, who don't require the same level of financing as the average off-grid household. It may also be the case that these sales volumes include systems purchased as government bulk procurements, especially in the East Asia and Pacific region.

The top selling SHS category in this segment stands firm as the 21-49 Wp systems, with nearly 280,00 units sold. This is the entry point to the market for SHS capable of powering TVs and the

increase in sales of these SHS is likely connected to the strong customer demand for entertainment appliances. With TVs becoming more energy efficient and inexpensive, this may see these SHS continue in their popularity. The second-best seller in this category is the 50-100 Wp with 220,00 reported sales, with the 11-20 Wp registering just above 210,00 units sold. The smallest sales recorded for SHS (120,000 units) remain in the 100+ Wp category, possibly due to their higher cost, which may put these bigger systems out of reach of the average off-grid household.

Although it remains the smallest category, the biggest percentage increase was recorded for SHS in the 100+ Wp category, with an 85% increase. This reporting round saw the highest sales volumes ever recorded across all segments, continuing the sales success story of SHS.

Figure 5 - Semi-annual Evolution of Global Sales Volumes by Product Category



NOTE:

Lanterns 0-1.5 Wp include one light and no mobile charging, lanterns 1.5-3 Wp one light and mobile charging, and multi-light systems 3-10 Wp at least two lights and mobile charging. Solar Home Systems >11 Wp are classified based on panel wattage.

Regional Market Insights

This section offers an overview of the narratives behind the sales volumes across different regions reported for the period July–December 2019. For greater context this includes a comparison with previous rounds which can be seen in Figures 6 and 7. Nuanced insights by product category in each region are given in Figures 8–11. For more insights into the countries affecting these regional trends, please refer to the 'Market Insights by Country' section on page 30.

Sub-Saharan Africa

Sub-Saharan Africa records the highest volumes ever with almost 3 million units sold. Below, the sales are broken down into the different regional categories.

East Africa

East Africa drives the substantial growth in the Sub-Saharan Africa region, **recording the highest volumes ever with 2.43 million units – a 40% increase with respect to the first half of 2019.** This growth translates into a 53% boost in the cash segment and an increase of 21% for PAYGo. This growth is in line with typically observed seasonal spending patterns, with the second half of the year consistently reporting stronger sales figures than the first. The second half of the year, starting in June, usually records higher sales after the harvesting of crops generates more income.

West Africa

Sales in West Africa remain stable, hovering around 370,000 after the large increase seen in last round. The cash segment shows stability with a decrease of 8%, while the PAYGo one had a small increase of 14%.

Central Africa

The Central Africa region maintains overall stability, registering around 120,000 sales. The region is still dominated by cash sales due to the frequency of bulk procurements in the region, which are one-offs, therefore fluctuations are expected round on round. **PAYGo sales here report a strong 63% increase** reaching almost 35,000 units, while cash sales are starting to decrease (-15%) following the sales peak recorded in the last round but continuing to represent the majority of sales with nearly 90,000 units.

Southern Africa

In terms of regional markets, Southern Africa remains the smallest. This is to be expected as, in general, the countries in this geographic area have a higher percentage of reliable grid access. Only 20,000 units were sold in this region, with cash sales still being predominant covering 66% of the

total. No particular trends have emerged yet, due to the small number of sales recorded.

Asia

South Asia

In South Asia, sales units fall under the one million mark for the first time since 2014, with 840,000 units sold, continuing the downward trend seen in previous rounds. This decrease is mainly due to the dip in cash sales, resulting from large decreases observed in India and the lack of bulk purchases of lanterns in Bangladesh that has materialised in the first half of the year for the past two years. By nature such procurements are one-offs, therefore fluctuations are expected round on round. Penetration of PAYGo is still limited in the region, as South Asia largely consists of cash-based economies.

East Asia and Pacific

East Asia and Pacific registers as the third largest region worldwide with 250,000 units and a 71% sales growth compared to last round. In particular, the data shows that systems in this region are predominantly sold on a cash basis. One peculiarity in the data, in contrast to other regions, is that the majority of the cash products sold are not portable lanterns, but rather larger 100+ Wp systems. The PAYGo segment seems to follow a downward trend, with very small volumes recorded for the whole of 2019, especially when compared to 2018.

Other Markets

Middle East and North Africa

Middle East and North Africa (MENA) records sales of just 210,000 units. This represents a shrinkage of 50% compared to last round. For this region, we commonly see a significant number of sales arise from bulk purchases of portable lanterns with mobile charging by humanitarian agencies. By nature such procurements are one-offs, therefore fluctuations are expected round on round. The data this round appears to be affected by an absence of any bulk purchases between July and December.

Regional Market Insights

Latin America and Caribbean

This remains a small region in terms of recorded sales, with less than 100,000 units sold. However the region registered a 60% increase for the

second half of 2019, representing a significant boost in the market.

Figure 6 – Semi-annual Evolution of Volume of Products Sold Regionally

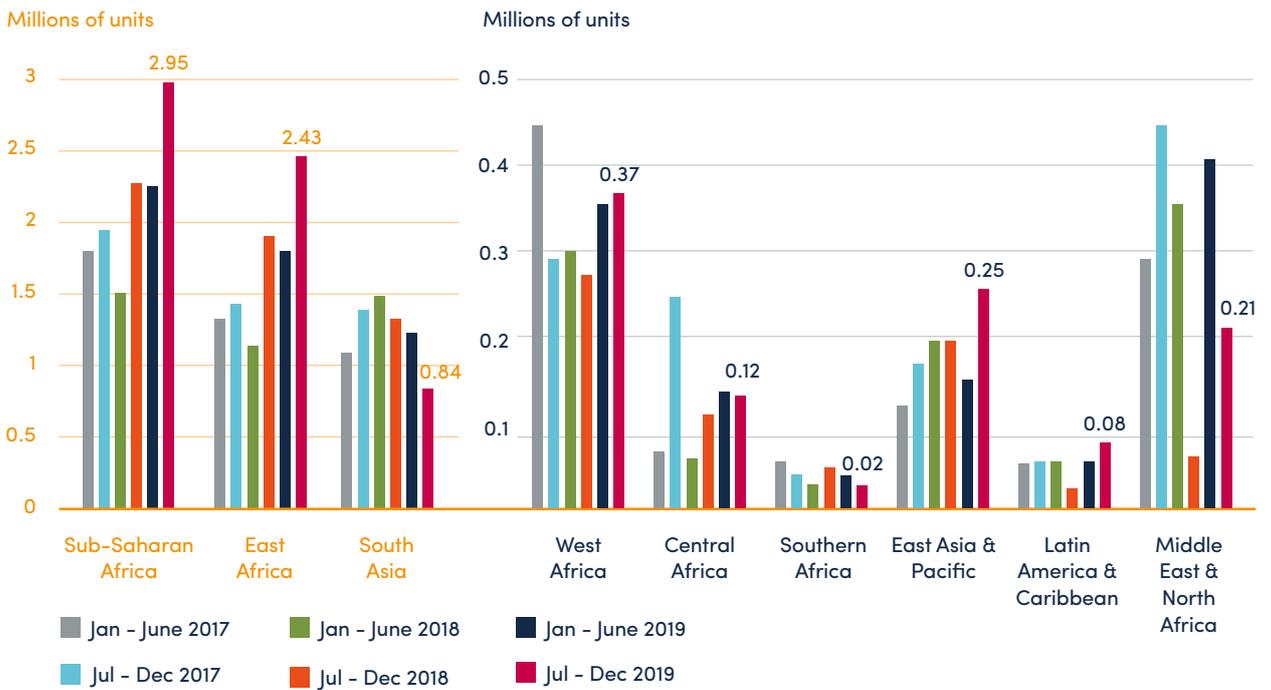
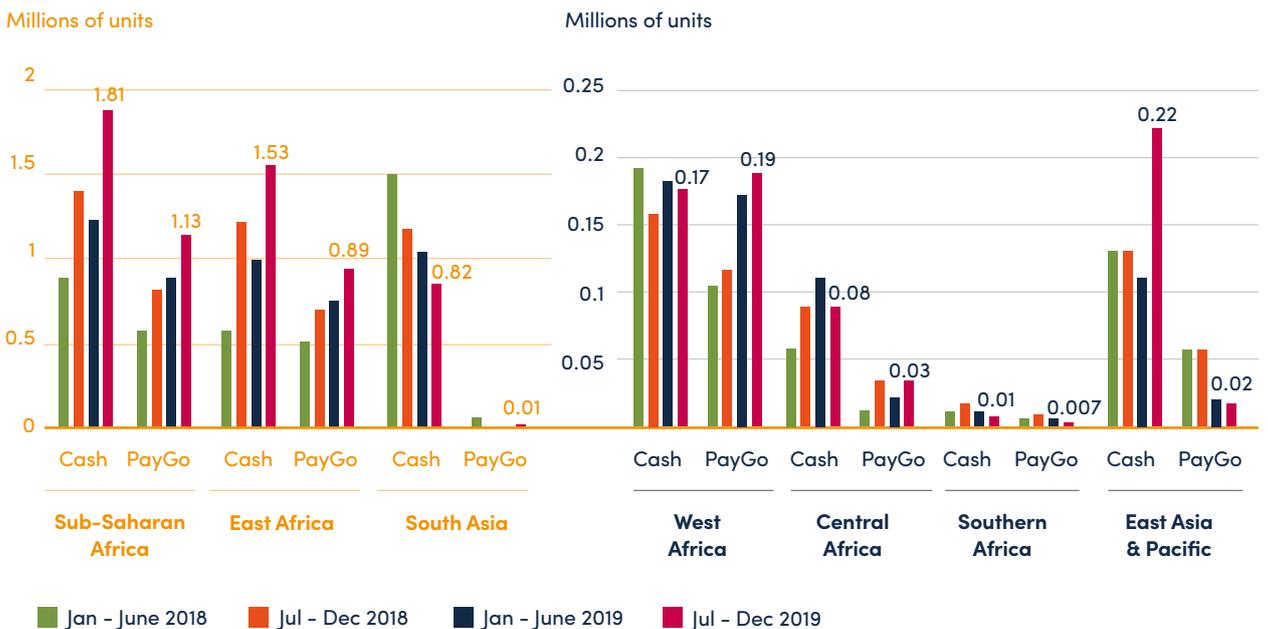


Figure 7 – Semi-annual Evolution of Volume of Products Sold Regionally with split Cash and PAYGo



NOTE:

Products are classified as 'Cash' when sold in a single transaction - typically including products purchased via tenders - or as 'PAYGo,' when the customer pays for the product in instalments over time or pays for use of the product as a service.

Regional Market Insights



Portable Lanterns

Sub-Saharan Africa accounted for 63% - 1.76 million units - of all sales of portable lanterns. This is a significant jump from only 1.3 million units in the last reporting round. This challenges the narrative around portable lanterns in previous reporting rounds, which saw global sales threatening to dip significantly due to commoditization of the market. This rebound in sales of lanterns could be explained by two factors: the first is a growth affiliates' sales likely due to bulk purchases, of which we do not know the nature; the second is increased participation from manufacturers in the reporting process, with 62 in total compared to the 56 of the past round. By nature such procurements are one-offs, therefore fluctuations are expected round on round.

South Asia covers 24% of global portable lantern sales - 700,000 units - which currently stands as the lowest amount ever recorded in this category. As previously stated, this stems from the

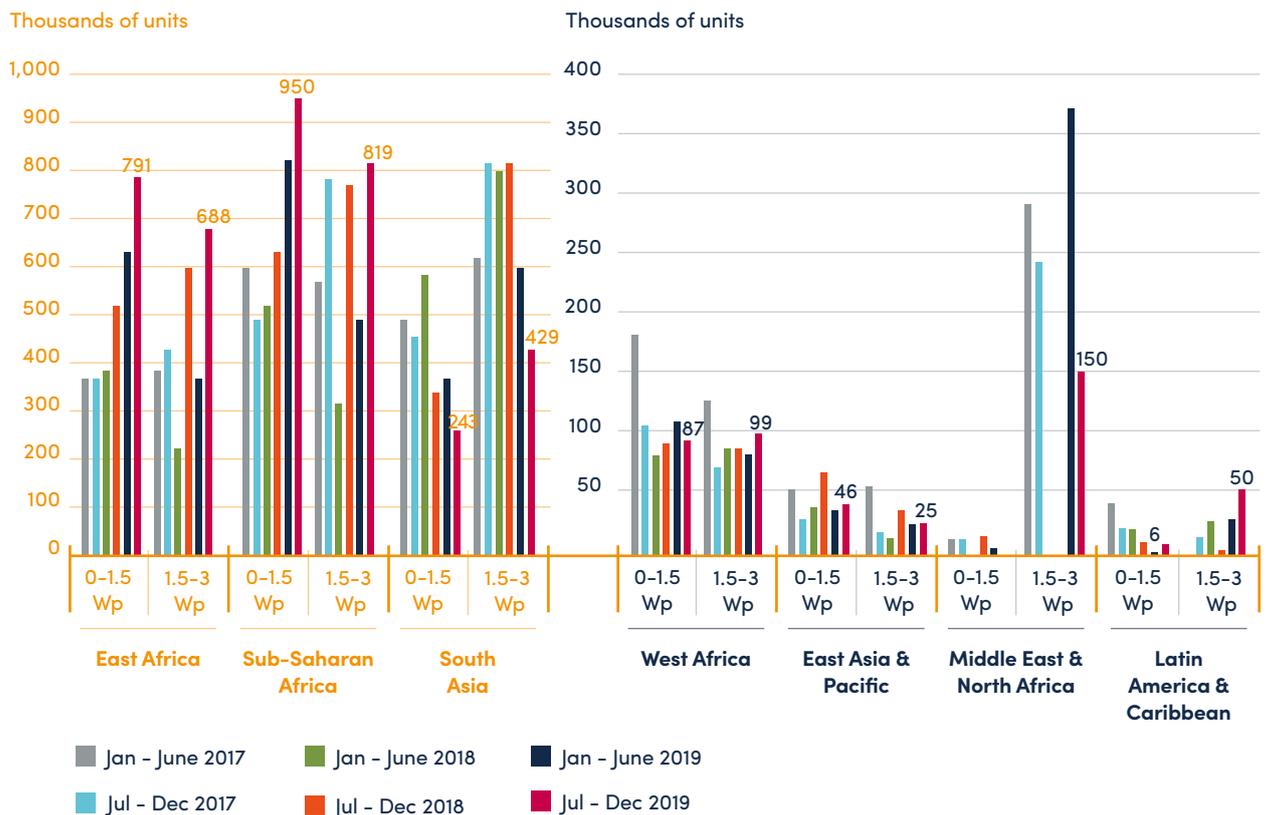
large decreases observed in India and the lack of bulk purchases of lanterns in Bangladesh that materialised only in the first half of the year in the past couple of years. By nature such procurements are one-offs, therefore fluctuations are expected round on round.

West Africa records stable, comparatively low sales of lanterns, while the Middle East and North Africa reports a dip in sales this round after the large volumes registered in previous reporting rounds.

East Asia and Pacific remains a small market for sales of portable lanterns, with volumes remaining on the same level as in the first half of 2019.

Latin America and the Caribbean saw an increase in sales of lanterns with mobile charging, reaching 50,000 units; sales of lanterns remain very marginal with only a few thousands units sold.

Figure 8 – Semi-annual Evolution of Volume of Lanterns Sold Regionally



NOTE: Lanterns 0-1.5 Wp include one light and no mobile charging, lanterns 1.5-3 Wp one light and mobile charging.

Regional Market Insights



Multi-light Systems

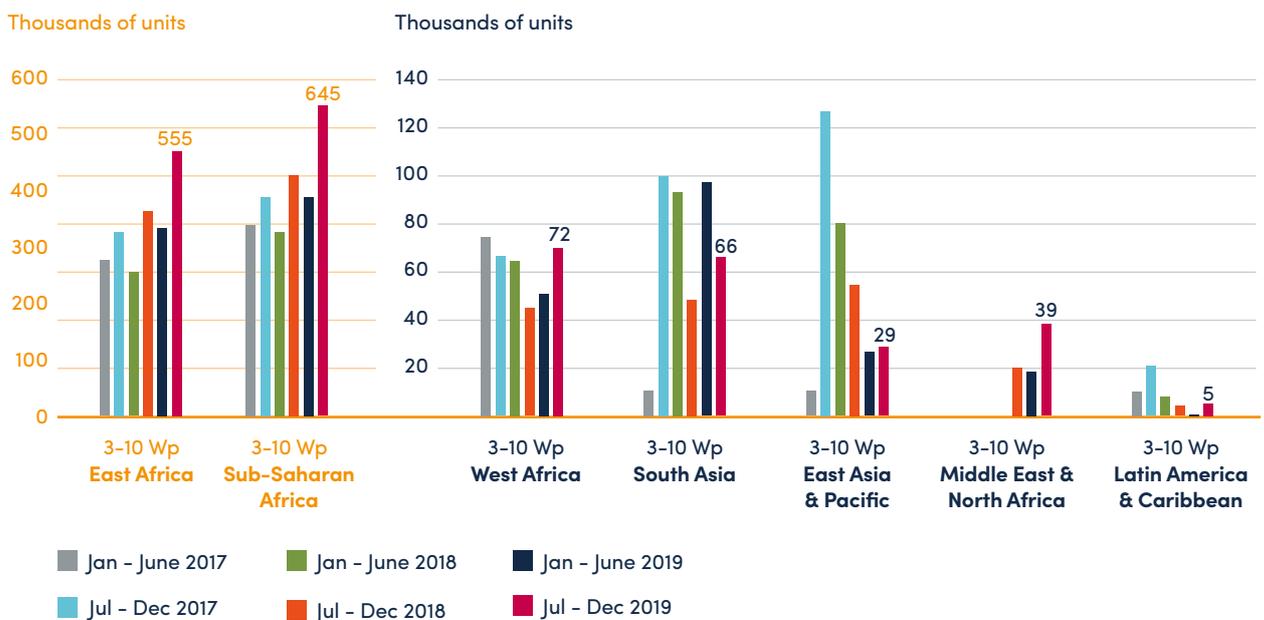
Multi-light systems, contrary to last round, have experienced an increase across all African regions. East Africa saw a 42% increase compared to the first half of 2019, while West Africa recorded a boost of 40% in this category.

In South Asia sales dipped after the increase reported last round. This is mainly due to the decreases occurring in India, where sales have been hindered by grid expansion, as well as by the Non-Banking Financial Company crisis which reduces the fund availability for MFIs and Small Banks. In particular, the limited fund availability for MFIs has impacted this region as they are the preferred channels our affiliates use to reach new customers.

A 40% increase was also registered in the MENA region where it is likely that the sales were driven by aid, such as a bulk procurement for humanitarian relief. By nature such procurements are one-offs, therefore fluctuations are expected round on round.

Sales remain marginal in East Asia and Pacific and Latin America and the Caribbean.

Figure 9 – Semi-annual Evolution of Volume of Multi-Light Systems Sold Regionally



NOTE:
Multi-light systems 3-10 Wp include at least two lights and mobile charging.

Regional Market Insights



Solar Home Systems (SHS)

Small SHS (11-49 Wp)

Sub-Saharan Africa is still the major market for the small solar home systems, commanding 80% of the global total sales. East Africa is showing large increases across both segments with growth of 47% in 11-20 Wp systems and 20% in 21-49 Wp systems.

West Africa experienced for the second consecutive round a large increase in the 11-20 Wp SHS category, which saw a boost of 49% compared to the first half of 2019. After the record sales in the 21-49 Wp category of last round, sales remain strong in that product segment. South Asia represents only 10% of the global sales, registering a 41% decrease in the 11-20 Wp SHS category, whilst sales remain stable in the 21-49 Wp category.

Sales in East Asia and Pacific show little growth and remain small in these two segments.

Large SHS (50+ Wp)

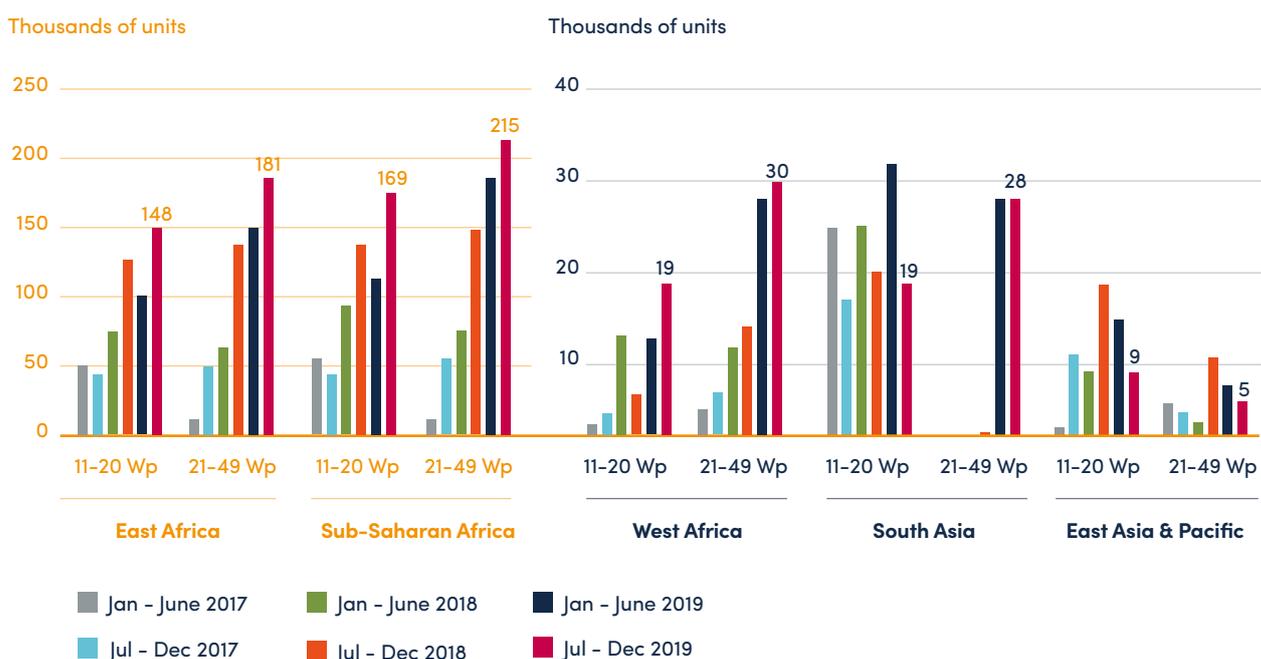
The large SHS categories with wattage 50+ Wp show a drastically different trajectory from that of their smaller counterparts.

Sub-Saharan Africa represents the lion's share of the sales of these two segments accounting for 43%. However the East and West Africa regions both register decreases for both the 50-100 Wp and the 100+ Wp segments after the peak reported in the last reporting round.

East Asia and Pacific represents another 40% of the global sales of large SHS with almost the totality of the products sold in cash.

South Asia represents 16% of the global sales, registering a decrease of 37% in the 50-100 Wp category and a large increase of 179% in the 100+ Wp category. However, in terms of number of units these segments remain marginal compared to the lanterns.

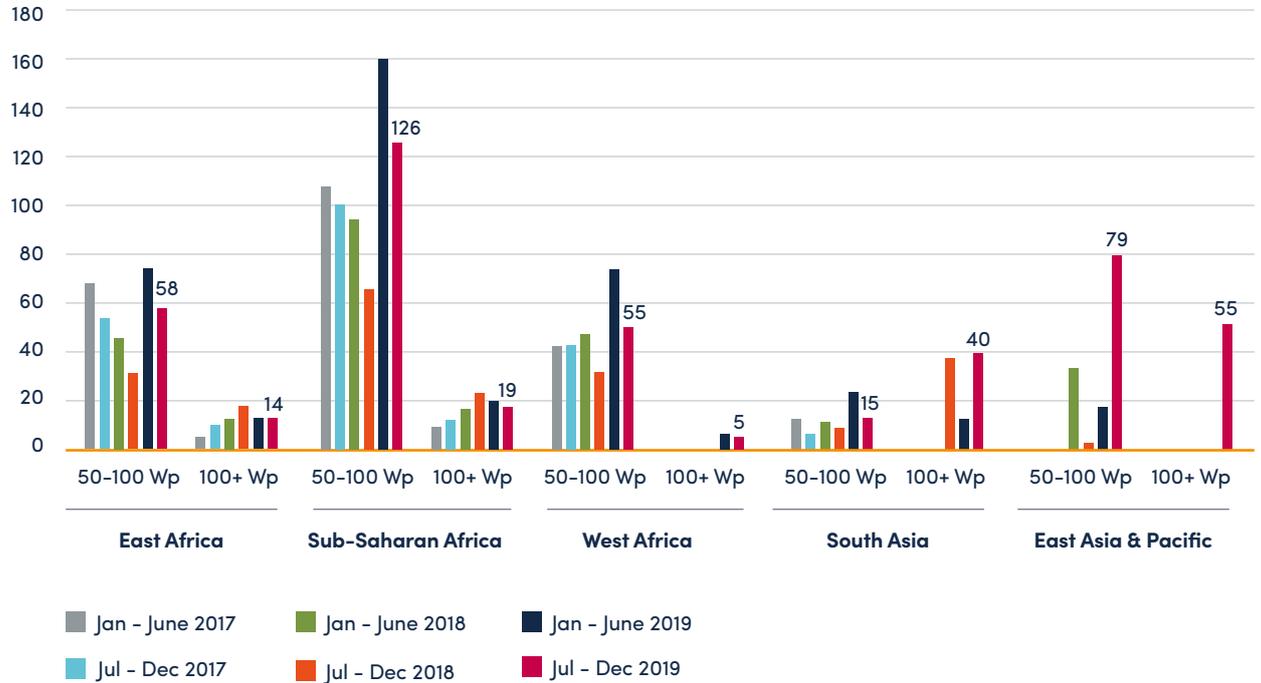
Figure 10 – Semi-annual Evolution of Volume of Small Solar Home Systems Sold Regionally



Regional Market Insights

Figure 11 – Semi-annual Evolution of Volume of Large Solar Home Systems Sold Regionally

Thousands of units



Why do some graphs have empty bars?

Data covering a specific region, country or product category is only included when it has satisfied the three-data point rule. Where there are fewer than three responses for a region, country or product category, no results are shown to protect the proprietary interests of the companies that supplied data in support of this industry report. This is signaled by an empty bar next to the name of the region, country or product category. While if there are no companies reporting data at all, the graph shows a 0.

Market Insights by Country

This report exclusively covers data for national markets where at least three manufacturers reported sales; totalling 42 countries in this July–December 2019 reporting period.

A detailed analysis of countries divided into regions follows with evolutions of volumes shown in Figures 12–17. An overview of all countries sales volumes is given in Table 5. Note that the detailed sales by product category per country remain available only for participating companies.

East Africa

Kenya still has the lion's share of the market with 995,000 units sold. This round sees the country once again break records and edge even closer to one million units sold in a single reporting period. The solar home systems product category sees the largest percentage growth, particularly in the 11–20 Wp and the 100+ Wp segments. Yet portable lanterns without mobile charging are still seeing the largest absolute growth, with almost half of all sales in the country – 45% – being this product type. Decreases have been experienced in the lanterns with mobile charging and the multi-light systems. This growth is supported by various market drivers including: companies operating with greater effectiveness of larger agent networks to reach more customers, increased price competition of SHS suppressing prices and boosting competition between companies, the stable regulatory environment, and the ongoing Kenya Off-Grid Solar Access Project (KOSAP) funded by the World Bank.

Ethiopia firmly established itself as the second largest market, recording unprecedented volumes of 720,000 units with a 144% increase. Due to the prevailing fiscal climate in Ethiopia, sales are inextricably dependent on availability of foreign exchange currency (FX) required to import products. The World Bank funded credit line of the Development Bank of Ethiopia (DBE) was recapitalised at the end of 2018. Imports recorded in this reporting period can be mainly attributed to DBE providing companies with new access to FX for importation. Moreover, in the last 12 months, Ethiopia government has been focusing on streamlining its import regulation to align themselves with the IEC/LG standards. A pre-shipment inspection regime has been adopted, now beginning to show initial signs to stem the inflow of low quality products and consequently increasing the share of quality verified products. We will continue to monitor the impact of this regulation/policy. The increase is stronger in the

cash segment which spiked 160%, particularly for lanterns with mobile charging. Ethiopia's relaxed regulation around digital payments has opened up some opportunities for PAYGo business models. As a result, the PAYGo segment increased by 40% compared to the last reporting period, with sales of small solar home systems picking up as well as multi-light systems. The country's economy is growing, despite civil unrest and, evidently, demand for solar products remains strong.

Uganda shows a trend similar to that seen in 2018, with the second half of the year recording higher volumes than the first six month period reaching 220,000 units. Growth of 20%, split equally between the cash and PAYGo segments, has been recorded in the country. Particularly, growth in the multi-light systems space and the lanterns without mobile charging sector is strong, while SHS categories show small decreases.

After the difficulties recorded in **Tanzania** in the previous reporting rounds, sales doubled to reach 180,000 units between July–December 2019; such high sales volumes had not been registered since 2016. The surge is equally split across the cash and PAYGo segments. Notably, growth is registered in almost all product categories, with lanterns and multi-light systems the driving force behind the rise, together with SHS of 11–20 Wp and likely sold together with appliances such as TVs. In terms of market drivers, the peak in PAYGo product sales may be influenced by the second stage of development organisation SNV's results-based financing (RBF) rolled out in the region. In future rounds PAYGo sales may be affected by the legislation of the Tanzania Microfinance Act 2018, which is yet to be fully clarified. Anecdotally, there have been reports of tenders from international charities awarded in the second half of 2019, which may explain the surge in cash sales.

Market Insights by Country

Zambia takes its place as the fifth largest market in the region with nearly 120,000 units, seeing a 70% increase in sales. This increase is mainly driven by cash sales seeing a large increase of 160%. Yet PAYGo is also seeing the lion's share with over 70,000 units, seeing a 36% increase. The largest seller remains the multi-light systems, followed by lanterns. Overall sales in the country may have been significantly influenced by USAID's Beyond the Grid Fund, which continues to drive growth in the country. In addition to this, the number of new companies entering the market continues to grow which may see a regular uptick in sales in future rounds if new companies continue to become active in the space.

Malawi saw the largest percentage increase in the East Africa region. The country registered a 480% increase passing 50,000 units sold, an impressive uptick after the low volumes recorded in the previous round. The PAYGo segment appears to have further established itself, reaching a new record of 15,000 units sold. The USAID SHS Kick-Starter Programme for Malawi, which started its disbursement in July 2019, may have influenced the sales of SHS, which are more commonly sold on a PAYGo basis. The programme includes multi-light systems in its definition of SHS, so it is likely that sales in that product category were affected too. The programme is expected to deliver between 100,000 and 150,000 connections over a three-year period, as well as seeking to bring in between \$15 to \$22.5 million of private investment into the SHS sector in Malawi. There is also significant upcoming support from the World Bank ACCESS programme for the off-grid sector, with the Kick-Starter catalysing the SHS market, and the World Bank ACCESS programme bringing in further support to maintain growth in SHS connections.

Rwanda continues to report a decline with another 25% decrease and recording less than 50,000 units sold. This decrease is mostly due to shrinking PAYGo sales. Cash sales are seeing a surge, surpassing PAYGo for the first time since data recording began in 2018, after a sales dip recorded in the past two rounds. Companies have shared accounts that sales are still stifled by government policies and regulations.

Madagascar saw a new surge in sales after the decrease recorded last round, reaching over 30,000 units sold. Over half of the volumes sold fall in the multi-light systems product category. Anecdotally, companies have reported successful duty- and tax-free imports this round, which may have caused the surge. However, such imports remain challenging as companies continue to report a lack of consistent application of exemptions, particularly for multi-light-point systems.

Zimbabwe's sales remain stable around 16,000 units compared to the second half of 2018, after missing data for the first half of 2019. Cash sales still have the lion's share covering nearly all the sales volumes.

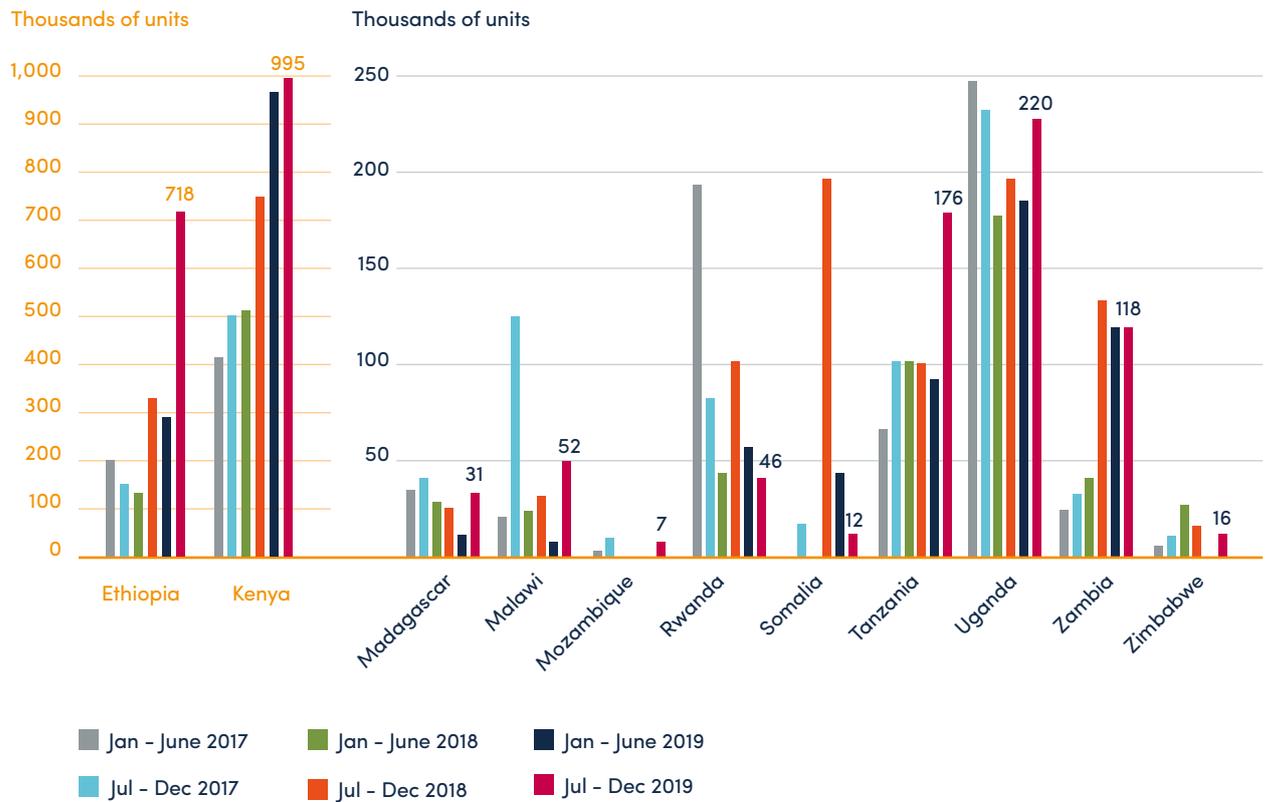
Somalia again records a deep decrease in sales of 70% going down to 10,000 units after the outlier of almost 200,000 units recorded as a bulk sales procurement in the second half of 2018. By nature such procurements are one-offs, therefore fluctuations are expected round on round.

Mozambique passes the three-data point rule again, after a few rounds of lack of visibility yet still remaining the smallest market with 7,000 units sold.

Burundi, Mauritius and South Sudan record sales but did not pass the three-data point rule.

Market Insights by Country

Figure 12 – Semi-annual Evolution of Sales Volume East African countries



NOTE: Countries that did not pass the three-data point rule for the current round have not been included in the graph. For past rounds, where less than three manufacturers are reporting, we are showing an empty bar. While if there are no companies reporting data at all, the graph shows a "0".



Market Insights by Country

West Africa

Nigeria remains the largest market in the region, recording a new record in sales volumes (nearly 170,000 units) with a 23% increase. The increase is larger in the cash segment with a hike of 27%, which remains the strongest segment due to the sales of portable lanterns. PAYGo saw a solid 15% increase with both multi-light systems and solar home systems continuing their upward trend. Nigeria's growth may be supported by the Nigeria Electrification Project (NEP), funded by the World Bank, and supported by Results Based Financing (RBF).

Cote d'Ivoire established itself as the second largest market in the region with 35,000 units sold, continuing its consistent market growth with an increase of 28% on the last reporting round. PAYGo continues to be the largest segment but no longer constitutes 100% of the country's sales, with cash sales recording around 5,000 units sold.

Benin continues its recent upward trend, recording a boost of 20% compared to the first half of 2019 and nearly 30,000 units sold. The country is dominated by PAYGo sales of multi-light systems. Yet an increasing number of companies entered the market, and the Off-Grid Clean Energy Facility (OCEF) is expected to cultivate growth through co-financing agreements with four companies in an agreement confirmed in February 2020.

Senegal registers a small decrease of 13% with volumes falling to 25,000 units, confirming what appears to be the country's seasonal trend which sees the first half of the year report higher volumes, when the harvesting season occurs. The decrease was caused by a dip in cash sales with a decrease of 37%, while PAYGo sales saw a 22% increase.

Togo recorded stagnation of its previous consistent growth, shrinking 11% and registering less than 25,000 units sold.

Sierra Leone recorded a 22% sales increase, registering 23,000 units sold.

Ghana recorded a 27% increase recording 17,000 units sold. Yet this is still a vast decline compared to the volumes recorded in 2017 and early 2018. The large majority of the increase is driven by sales of lanterns with mobile charging. Cash sales are still the majority of transactions with 10,000 units sold on a cash basis, accounting for most of the growth, while PAYGo seems stable around 7,000 units sold.

Niger recorded the largest percentage increase in the region with an impressive 325% and reaching record volumes of 14,000 units sold. It remains a 100% cash market with no PAYGo sales. The Niger Solar Electricity Access Project (NESAP), supported by the World Bank, likely has an influence on this sharp upward trend. Niger remains a country with much potential for growth of the off-grid solar industry as barriers to the sector are slowly eroding.

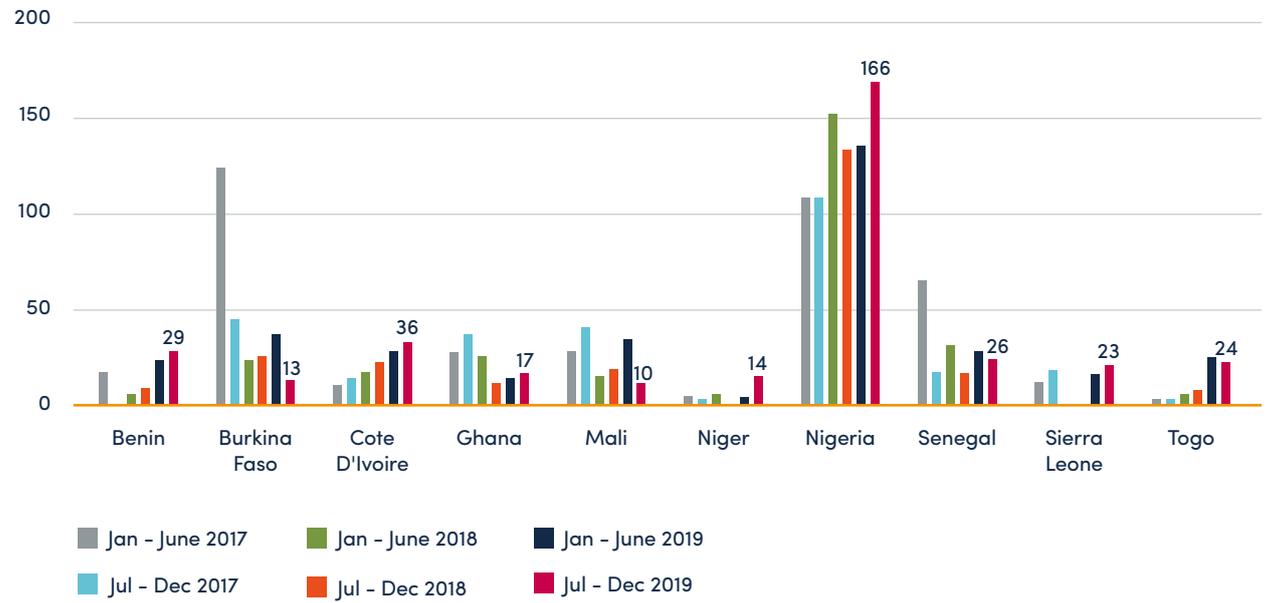
Burkina Faso and **Mali** saw large decreases in sales volumes of 65% and 71% respectively, after the exceptionally large volumes recorded in the previous round. Both the markets recorded sales slightly higher than 10,000 units. Decreases were visible for both cash and PAYGo in the region. The decrease in the cash segment is attributable to the lack of large bulk purchases of lanterns, reported in the last reporting round. By nature such procurements are one-offs, therefore fluctuations are expected round on round.

Guinea, Liberia and **The Gambia** lost visibility compared to the first half of 2019 as they did not satisfy the three-data point rule. Therefore it is not possible to ascertain a trajectory for these countries, although sales in each were reported. Similarly, sales were recorded for Guinea-Bissau and Mauritania, but these also cannot be reported as they did not pass the three-data point rule.

Market Insights by Country

Figure 13 – Semi-annual Evolution of Sales Volume West African countries

Thousands of units



NOTE:

Countries that did not pass the three-data point rule for the current round have not been included in the graph. For past rounds, where less than three manufacturers are reporting, we are showing an empty bar. While if there are no companies reporting data at all, the graph shows a "0".



Market Insights by Country

Central Africa

Cameroon remains the largest country in the region with stable sales at 70,000 units and only a slight decrease of 9% compared to last round. Cash sales continue to outnumber PAYGo, with sales of lanterns without mobile charging taking precedence, however this category also sees a decrease in overall sales. PAYGo saw another large 70% increase reaching 9,000 units sold.

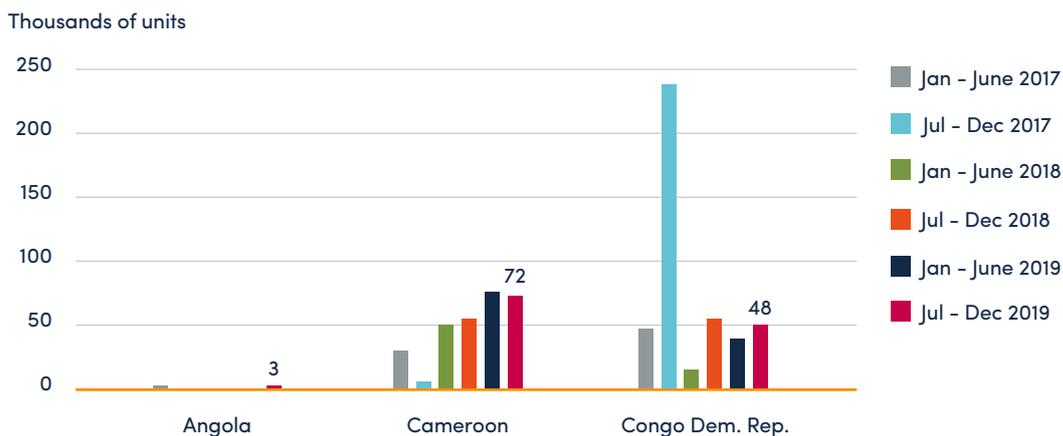
The Democratic Republic of the Congo, the largest potential market in the region, experienced a 25% increase, bouncing back from the decrease recorded in the last reporting round and reaching over 45,000 units sold in the current round. This seems to confirm a seasonal pattern, with the

second half of the year reporting stronger sales than the first. The growth is mainly for PAYGo which saw a 60% increase - reaching nearly the same number of units sold as the cash sales.

Angola again passes the three-data point rule showing 3,000 units sold after several rounds of no visibility.

In **Central Africa**, only the aforementioned three countries passed the three-data point rule this reporting round, but they represent nearly all the sales that occurred in the region, with just a few hundred units not accounted for, which go to **Chad** and **Gabon**.

Figure 14 – Semi-annual Evolution of Sales Volume Central African countries



NOTE:

Countries that did not pass the three-data point rule for the current round have not been included in the graph. For past rounds, where less than three manufacturers are reporting, we are showing an empty bar. While if there are no companies reporting data at all, the graph shows a "0".

Market Insights by Country

Southern Africa

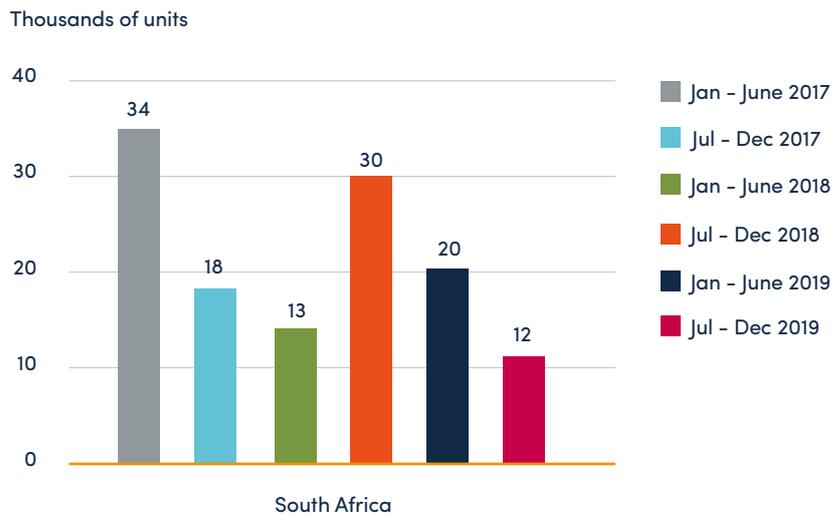
In general, the region experiences higher rates of grid access, making this a less high-priority region for off-grid solar in Sub-Saharan Africa, despite the fact that there are pockets of customers who remain in less electrified areas.

South Africa shows a downward trend compared to the previous rounds after the increase recorded

in the second half of 2018. In the second half of 2019 only a bit over 10,000 units were reported sold in the country.

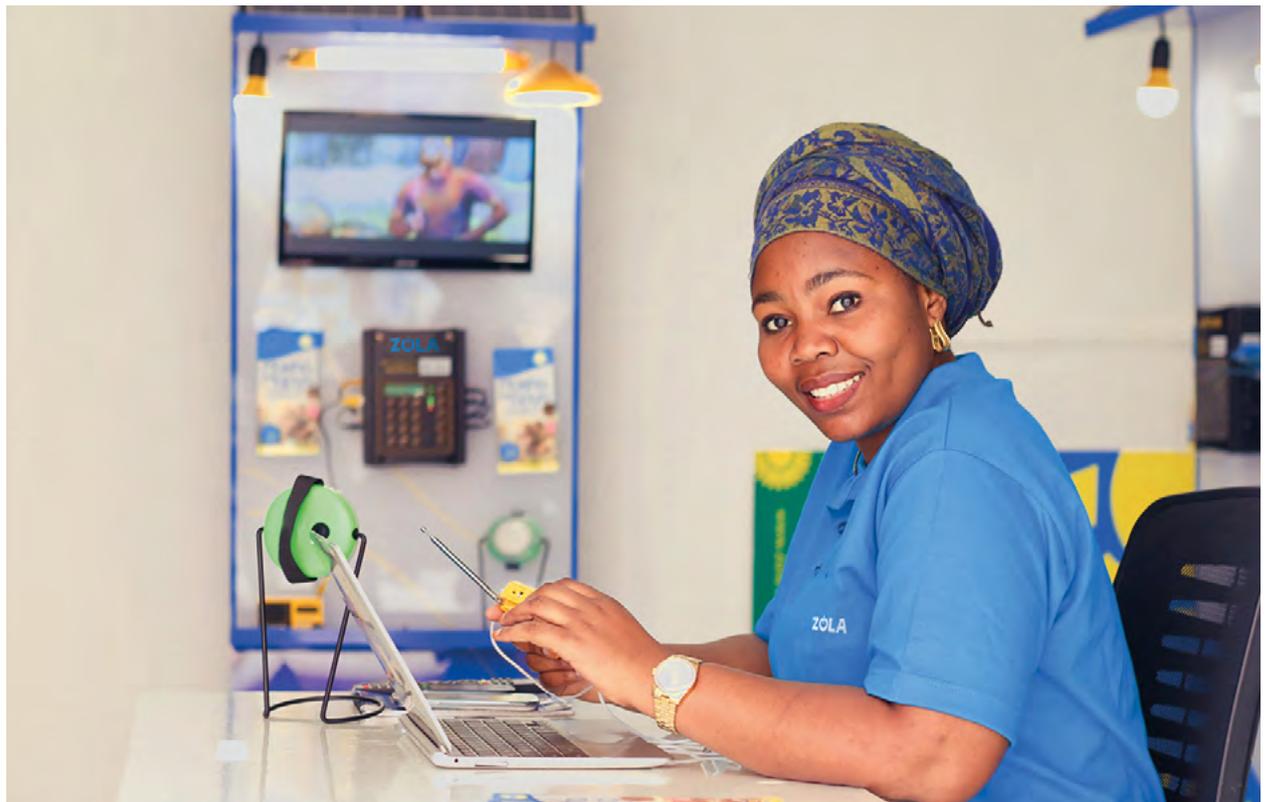
Botswana, Eswatini (former Swaziland), **Lesotho** and **Namibia** record sales but do not pass the three-data point rule.

Figure 15 – Semi-annual Evolution of Sales Volume South African countries



NOTE:

Countries that did not pass the three-data point rule for the current round have not been included in the graph. For past rounds, where less than three manufacturers are reporting, we are showing an empty bar. While if there are no companies reporting data at all, the graph shows a "0".



Market Insights by Country

South Asia

India, the largest market in the South Asia region, reported another 18% decrease with only 780,000 units sold, continuing the downward trend observed since early 2018. Most of the decline is in the cash segment which dominates 98% of the market, and particularly for lanterns with mobile charging and multi-light systems, while sales for lanterns without mobile charging remain somewhat stable. Solar home systems overall also remain stable as a category, but upon deeper inspection, this is due to the 100+ Wp category growth mitigating the decreases of all the other SHS categories. Anecdotally, companies reported this growth in the country is due to the fact that customer demand is shifting in favour of larger products and appliances. India has a complex sales environment with a number of factors leading to the decreased sales. These include a government procurement of off-grid solar products through schemes like 'Saubhagya' which was discontinued in 2019, grid expansion, and the Non-Banking Financial Company crisis which reduces the fund availability for MFIs and Small Banks. These factors either individually or cumulatively could have led to a dip in sales. The factors seem to hinder sales of our affiliates' products which are typically happening through MFI channels, however when looking at the non-

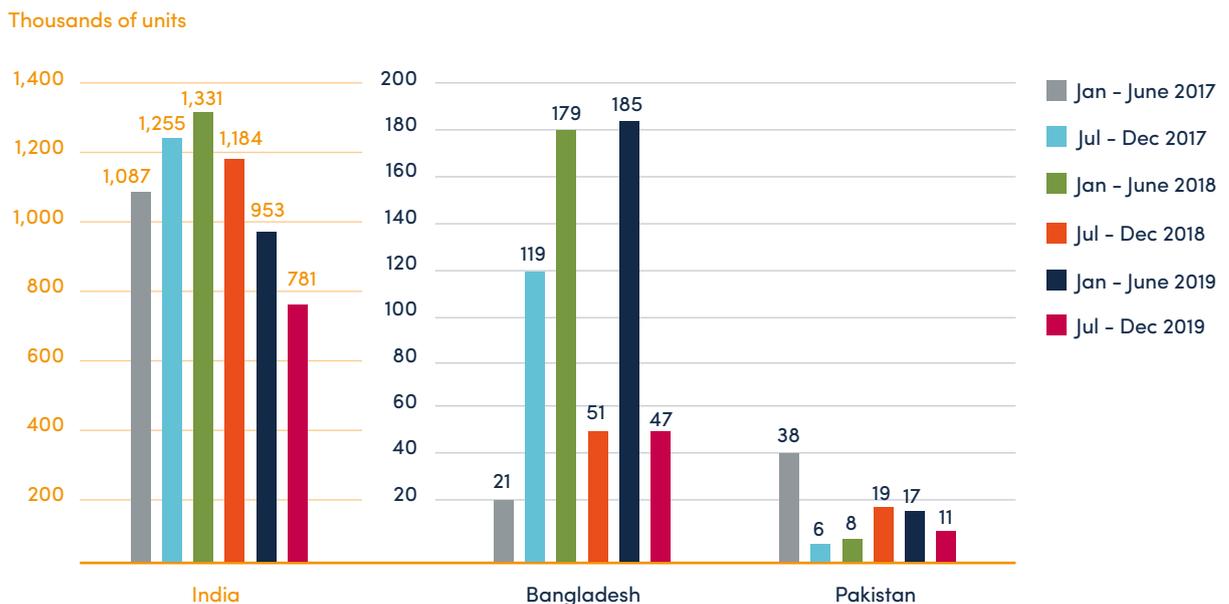
affiliate market, it seems that the import and sales of non-solar portable lanterns are still strong. These products are generally sold through retail channels and very often offer lower price points, therefore they seem to be continuing to thrive in the country.

Bangladesh experienced similar trends to those seen in 2018, with the second half of the year's sales falling due to the absence of relief agencies' bulk purchases of lanterns. This resulted in sales volumes falling to around 50,000 units. By nature such procurements are one-offs, therefore fluctuations are expected round on round.

Pakistan also shows a downward trend for the past two rounds. The product category split for the country does not pass the three-data point rule, not allowing us to elaborate on which of the product categories are most responsible for this decrease. It is not clear whether this is affected by the 50% decrease in the value of the rupee which occurred between January 2018 and June 2019, which could have reduced the household purchasing power.

Sri Lanka recorded sales but did not pass the three-data point rule.

Figure 16 – Semi-annual Evolution: Sales Volume South Asian Countries



NOTE:

Countries that did not pass the three-data point rule for the current round have not been included in the graph. For past rounds, where less than three manufacturers are reporting, we are showing an empty bar. While if there are no companies reporting data at all, the graph shows a "0".

Market Insights by Country

East Asia and Pacific

Myanmar is once more the largest market in the region, recording an impressive growth of 150% and on the cusp of reaching 150,000 units sold. Portable lantern sales remain small in the country and sales of small solar home systems see a decrease. The growth in this country is due to the surge in sales of large solar home systems with 50+ Wp panels. It is particularly pertinent that these systems are almost entirely sold on a cash basis and connected to government tenders. A severe monsoon season has likely affected an already weak and unreliable grid, which could have led to the boost in sales as customers turn to off-grid solar solutions as a back up. PAYGo sales in the country decreased from 20,000 to just 6,000 units which is likely due to issues with raising sufficient growth capital as there are no local currency financing options in the country which may have temporarily stalled market growth.

The **Philippines** has climbed back up to the sales volumes recorded in the second half of 2018, reaching over 40,000 units sold. Growth has been observed both for cash and PAYGo, with the former growing presenting stronger growth. It's probably that these cash sales are influenced by bulk procurements, which would explain the country's fluctuations as those are typically one-offs. However, it seems that a PAYGo market is being established in the country. In terms of market

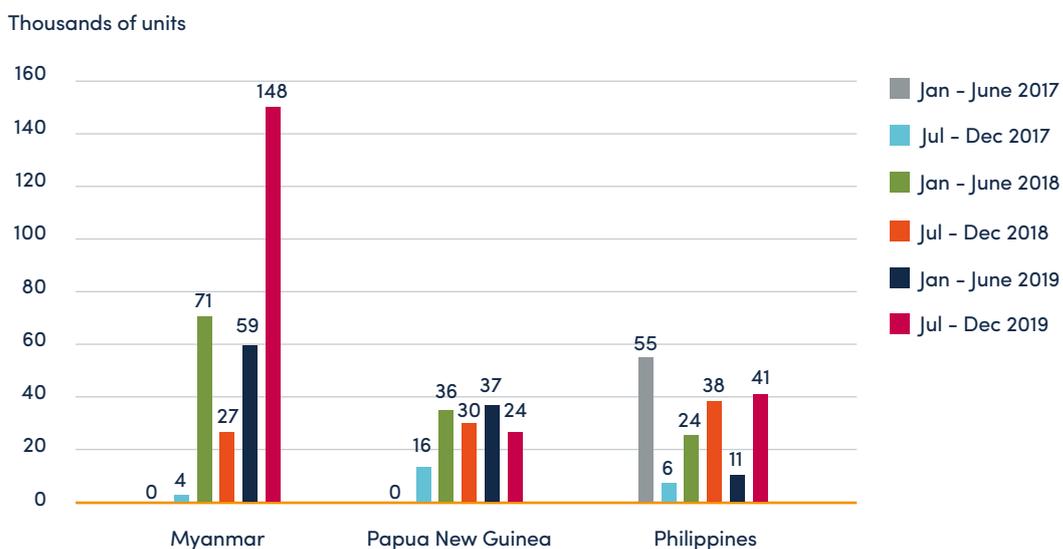
drivers, government tenders compounded by the effects of severe monsoon and flooding, could explain the increase.

Papua New Guinea reported a 35% decrease, with less than 25,000 units sold. This could point towards a possible seasonal pattern, similar to those observed in other regions, with the first half of the year reporting stronger sales than the second. Particularly decreases were observed for lanterns with mobile charging and the multi-light systems. The country's 2018 recession is still having an impact in the country which could be a factor in the fall in sales. Moreover, non-affiliates are very active in the country, and it is possible that affiliates are losing market share causing the volumes shown here to decrease.

Vanuatu does not pass the three-data point rule, after the falling sales volumes of last round, therefore nothing can be concluded regarding the evolution of sales in the region. This is likely due to the lack of government financed procurements from affiliates in this reporting round, which normally make a significant contribution to reported sales in the country.

Cambodia, Fiji, French Polynesia, Indonesia, Malaysia, Singapore, Thailand and Vietnam record sales but do not pass three-data point rule.

Figure 17 – Semi-annual Evolution: Sales Volume East Asian & Pacific Countries



NOTE:

Countries that did not pass the three-data point rule for the current round have not been included in the graph. For past rounds, where less than three manufacturers are reporting, we are showing an empty bar. While if there are no companies reporting data at all, the graph shows a '0'.

Market Insights by Country

Middle East and North Africa

The **Middle East and North Africa** region is a large market with over 200,000 units sold in total. However, little can be said about which countries contribute to the sales due to the three-data point rule applied in this report, for most countries in the region, less than three manufacturers reported sales.

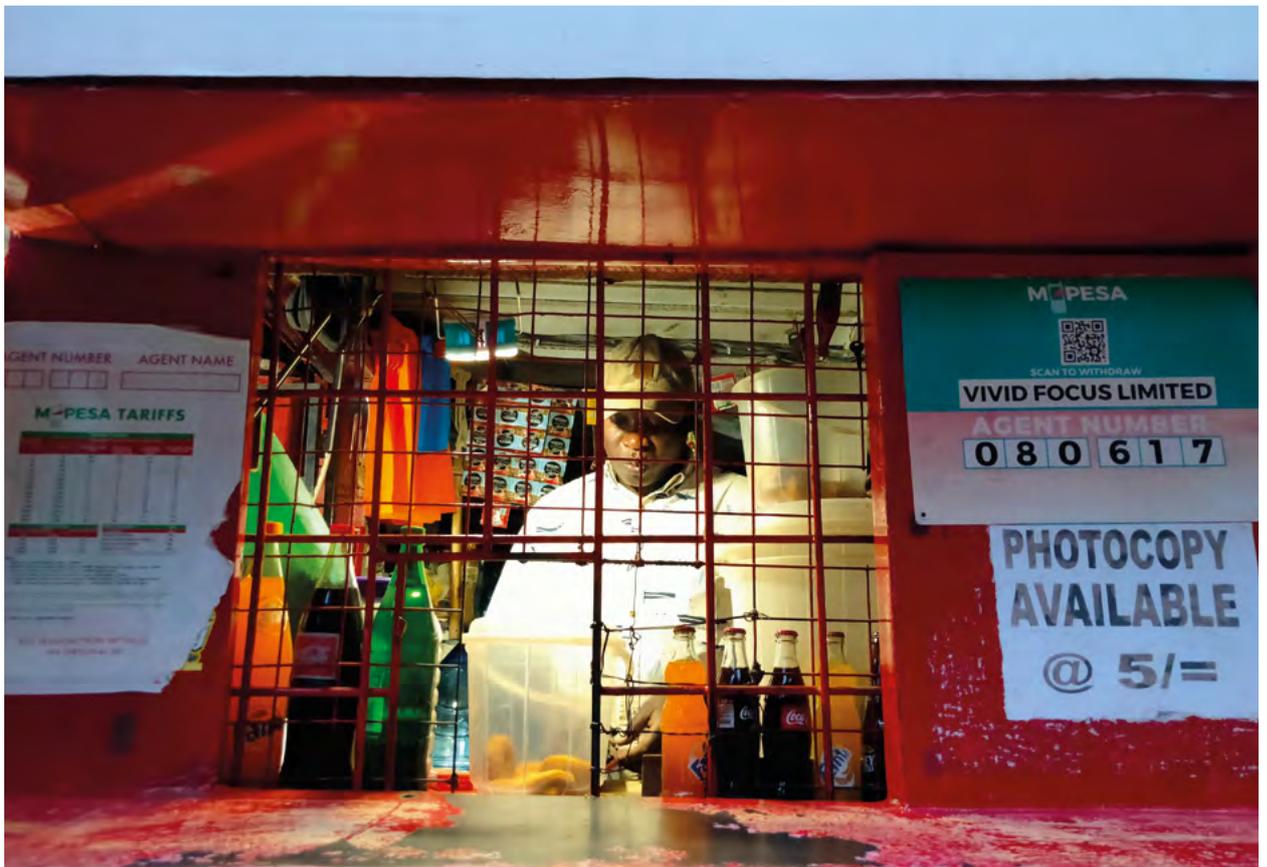
Only the **United Arab Emirates** passed the three-data point rule in this round, reporting around 50,000 units sold. However, it is very likely that these sales are going to other country markets within the region.

Lebanon, Syria, and Yemen record sales but, again, do not satisfy the three-data point rule. It can be noted that a World Bank funded initiative in Yemen is supporting the bulk purchase of SHS and sales through microfinance institutions, via a tender process coordinated by the United Nation Office for Project Services (UNOPS).

Latin America and the Caribbean

Latin America and the Caribbean shows over 80,000 units sold. However, as with the Middle East and North Africa, little can be said about which countries contribute to the sales due to the three-data point rule applied in this report as less than three manufacturers reported sales in all but two of the countries. Sales in the region are low as it does not present significantly attractive commercial markets for affiliates due to relatively high electrification rates and local companies operating.

This round only **Guatemala** and **Peru** pass the three-data point rule, showing respectively 6,000 and 2,000 units sold.



Market Insights by Country

Table 5 - Sales Volumes by Country

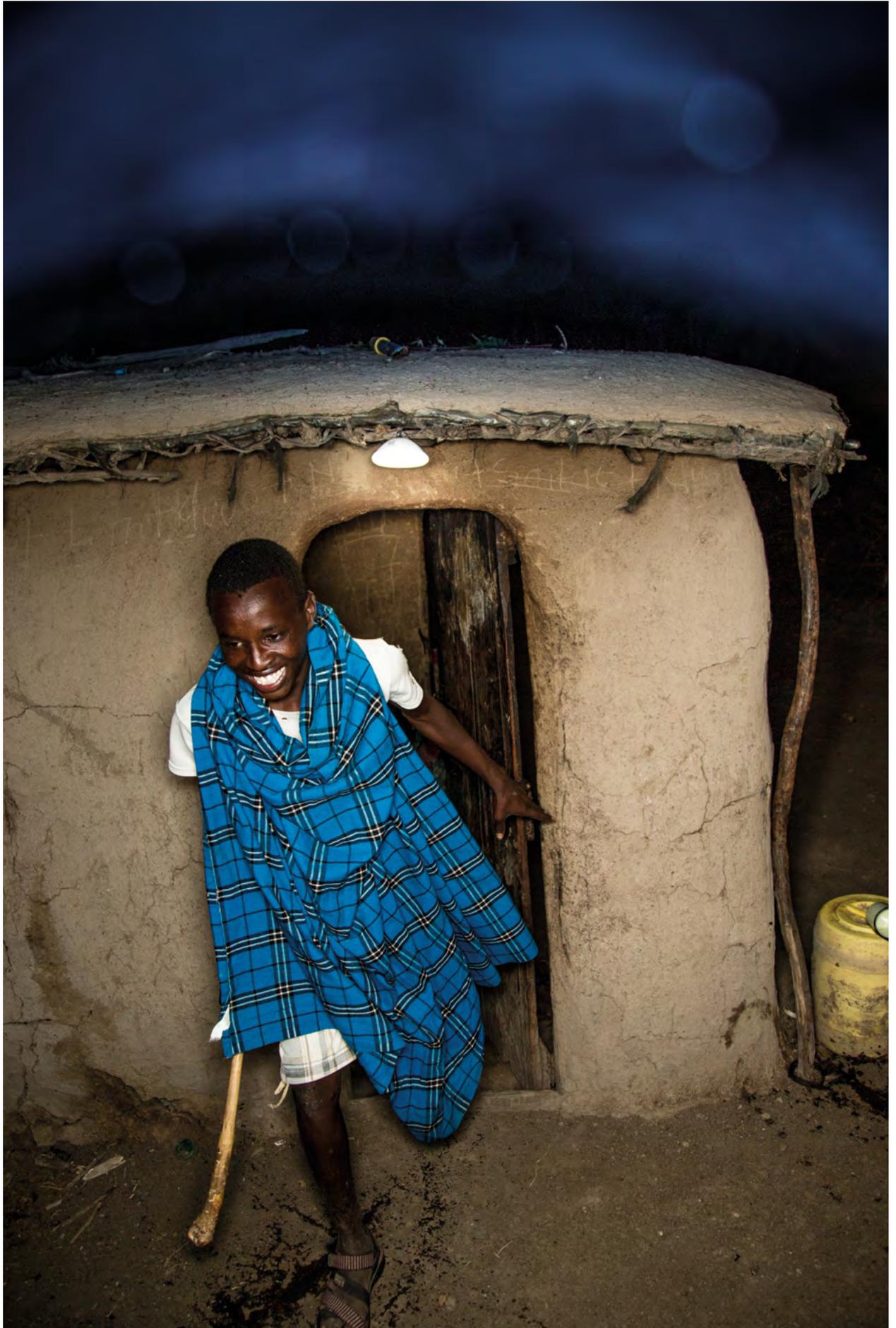
Countries	Sales Volumes		
	Total	Cash	PayGo
Sub-Saharan Africa	2.945.323	1.812.231	1.133.092
East Africa	2.434.236	1.534.349	899.887
Burundi			
Eritrea	0	0	0
Ethiopia	717.759	658.982	58.777
Kenya	994.511	498.429	496.262
Madagascar	30.686		
Malawi	51.703	23.293	28.410
Mauritius			
Mozambique	6.573		
Rwanda	47.984	32.535	15.449
Somalia	11.616		
South Sudan			
Tanzania	176.375	114.858	61.517
Uganda	219.755	75.618	144.137
Zambia	118.458	47.862	70.596
Zimbabwe	16.210	15.944	266
West Africa	366.402	174.482	191.920
Benin	29.021	444	28.577
Burkina Faso	13.289	12.690	599
Cote d'Ivoire	35.522	5.187	30.335
Equatorial Guinea	0	0	0
Ghana	17.337	9.687	7.650
Guinea			
Guinea-Bissau			
Liberia			
Mali	10.140		
Mauritania			
Niger	13.811	13.811	0
Nigeria	166.284	112.428	53.856
Senegal	25.681	10.937	14.744
Sierra Leone	22.635		
The Gambia			0
Togo	23.904		
Central Africa	123.155	89.211	33.944
Angola	2.950		
Cameroon	71.864	62.294	9.570
Central African Republic	0	0	0
Chad			
Congo, Rep.	0	0	0
Democratic Republic of Congo	48.027	24.215	23.812
Gabon			
Southern Africa	21.350	14.189	7.341
Botswana			
Eswatini			
Namibia			
South Africa	12.201	9.862	2.339

Countries	Sales Volumes		
	Total	Cash	PayGo
South Asia	838.696	822.388	16.308
Afghanistan	0	0	0
Bangladesh	46.575		
Bhutan	0	0	0
India	781.165	769.137	12.028
Nepal	0	0	0
Pakistan	10.756		
Sri Lanka			
East-Asia & Pacific	246.723	220.557	26.166
Cambodia			
China	11.207	11.207	0
Hong Kong SAR, China			
Fiji			
French Polynesia			
Indonesia			
Malaysia			
Myanmar	148.235	141.252	6.983
Papua New Guinea	24.399	23.260	1.139
Philippines	40.657	25.935	14.722
Singapore			
Thailand			
Vanuatu			
Vietnam			
Middle East & North Africa	212.672		
Iraq	0	0	0
Lebanon			
Morocco			
Syrian Arab Republic			
United Arab Emirates	46.245	46.245	0
Yemen, Rep.			
Latin America & Caribbean	84.063	72.171	11.892
Antigua and Barbuda			
Argentina			
Bahamas			
The Barbados			
Brazil			
Chile			
Colombia			
Costa Rica			
Dominican Republic			
El Salvador			
Guatemala	5.625		
Mexico			
Panama			
Peru	2.042		
Venezuela			

NOTE:

When there are fewer than three responses, no results are shown to protect the proprietary interests of the companies who have supplied data in support of this industry report. While if there are no companies reporting data at all, the graph shows a 0. Note that only an excerpt of countries is included above, excluding all the countries showing 0 sales globally for both cash and PAYGo.

Market Insights by Country





Off-Grid Solar Appliances



Behind the numbers

Background

Off-Grid Solar Appliances are defined as energy-efficient electrical appliances that are appropriate for off-grid or weak-grid areas⁸ where low capacity power systems are not suitable to support the use of conventional appliances. These devices are typically compatible with a DC-powered system and are usually more energy efficient than their traditional counterparts, allowing relatively lower-load energy systems to power them.

Since 2018, the Global Off-Grid Solar Market data collection has included off-grid solar appliances. This was made possible by the partnership established between GOGLA and the Efficiency for Access Coalition thanks to funding provided by UKAID.

Access to these appliances unlocks new and better quality energy services for both domestic and commercial customers and end-users. They can also unlock new income generating activities or boost the productivity of existing ones.

To date this report focuses on the volumes of TVs, fans, refrigeration units and solar water pumps sold during the six month period. Besides these four appliance types, sales are also gathered for a wide variety of other appliances – such as hair clippers, irons, milling machines – however, these volumes are currently scattered and too small to pass our confidentiality rules. For the time being, the sales volumes of these appliances are currently not included in this report.

In future rounds of data collection, the research team will evaluate the best methodology to measure the market value of off-grid solar appliances, which is not currently available.

This report is constantly evolving, offering a snapshot of our diverse and eclectic industry across a growing number of countries. We welcome any suggestions or recommendations to improve it and better support our industry to contribute to the achievement of the 17 Sustainable Development Goals.

Market Drivers

As with off-grid lighting products, the data presented in this section of the report is influenced by external factors and market drivers. Where possible, to add context to the reported sales volumes, we have included an explanation of the key market drivers relevant to the data. These include:

- Actions and initiatives by development finance institutions, donor agencies and government market interventions.
- Developments in technology and increased competition on price.
- Availability of finance, in particular working capital and local currency financing.
- Macroeconomic factors, including general economic conditions, currency fluctuations, and other factors affecting the purchasing power of customers. One such example of this is the current COVID-19 crisis which did not affect the results shown in this report but which is having far-reaching impacts around the globe across sectors, industries and markets.
- Seasonal spending patterns and trends, as well as climate and other environmental factors.
- Competitive dynamics by non-affiliate companies on which we do not have great visibility.

Generally, increases and decreases in sales are investigated by the research team to find a plausible explanation for the change in reported volumes. For example, when West Africa presented unusually high sales volumes of refrigeration units in the second half of 2018, the team was able to trace them back to bulk purchases by humanitarian organisations for vaccine preservations.

However, it is not always possible to find a solid explanation, even with the most thorough efforts from the research team. This is because the market is nascent and continually shifting. Also in many instances market drivers overlap or interact with neighbouring sectors, such as a country's agriculture sector, causing variations in the sales of related appliances which are not always apparent during the research process.

⁸ "Off-grid" refers to populations that live beyond the reach of the national grid; "weak-grid" refers to populations that have unreliable grid connectivity and suffer frequent and sometimes lengthy outages.

Behind the numbers

Again, as can be expected in a nascent sector, fluctuations in the sales of main players can significantly influence the overall observed sales. As a result, changes in reported sales in any given market may be driven by the performance of a specific company or by wider market dynamics. In these cases, it cannot be explicitly referenced in the report in order to comply with confidentiality rules.

Limitations

At this early stage of data collection for appliances, only a small subset of all available appliances are considered, as we only take into account the solar-powered ones. Our scope is further narrowed to focus on appliances most suitable for purchase by individual customers on a household or micro-enterprise level. In the case of solar water pumps, this means that they must be less than 3 kW and solar-powered, while with regard to refrigeration units, large commercial scale walk-in units are not considered.

At times we receive too few data points within a given region, country or product category to pass our three-data point rule. This rule requires at least the presence of three separate product manufacturers to show sales for any single data point. When there are fewer than three separate companies responses for a region, country or product category, no results are shown in order to protect the proprietary interests of the companies which have supplied data in support of this industry report. This is signaled by an empty

bar next to the name of the region, country or product category, while if there are no companies reporting data at all, the graph shows a 0. We are pleased to note that the number of countries passing the three-data point rule continues to increase round on round, with 28 countries passing this round compared to 25 in the previous round. This trend is expected to keep improving as more participation is leveraged and the nascent appliance markets mature over time.

For the time being, the sales of off-grid solar appliances are collected separately from off-grid solar lighting sales, without distinguishing if appliances are sold bundled with SHS or standalone with their own panels. Efforts will be made to link these two segments to identify key connections and trends in future rounds.

Off-Grid Solar Appliances Highlights

Key Figures

Sales refer to all off-grid solar appliances⁹ reported sold by participating affiliates¹⁰ in the period between July 1st–December 31st, 2019



⁹ All off-grid solar appliances refer to the TVs, fans, solar water pumps and refrigeration units sold targeting customers living in off- or weak-grid areas.

¹⁰ Affiliates include GOGLA members, companies selling products that meet Lighting Global Quality Standards, and appliance companies that participated in the Global LEAP Energy Efficient Appliance Awards or are engaging with the Low Energy Inclusive Appliances (LEIA) programme.

All Off-Grid Solar Appliance Market Insights

Global and Regional Insights

The phrase 'all off-grid solar appliances' refers to the sum of all TVs, fans, solar water pumps and refrigeration units reported as sold by affiliates in this time period.

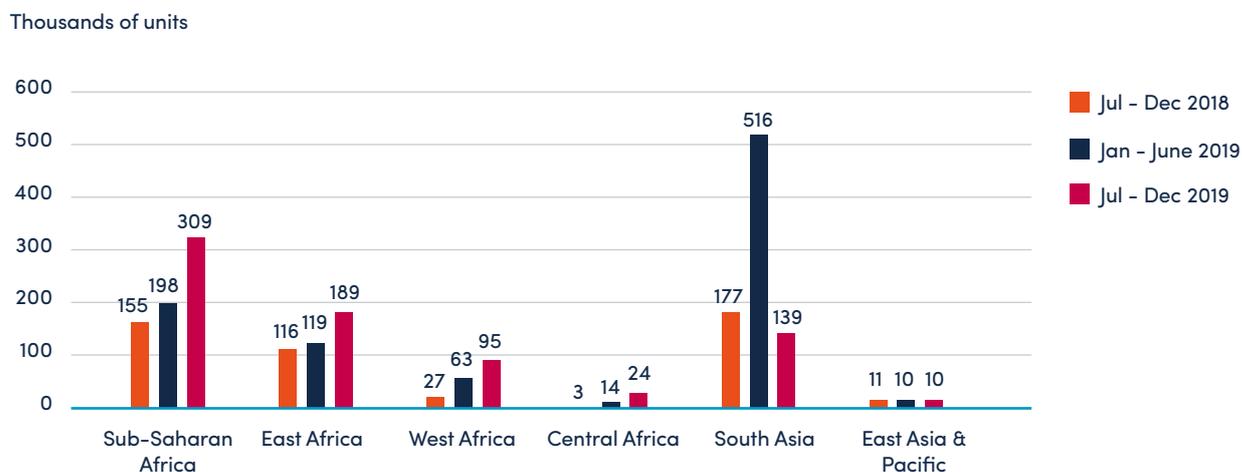
The total recorded number of global appliance sales reached almost half a million, standing at 460,000 units. TVs were by far the most popular appliance sold during this reporting round. An overall decrease in sales of appliances was observed compared to the previous reporting round, but as Figures 18 and 19 demonstrate, this is entirely due to the decrease in the sales of fans in South Asia, rather than a fall in overall demand for appliances. Figure 19 shows how the volumes of all other appliances are growing. This growth is also reflected in regional markets, with every market, excluding South Asia, reporting overall growth.

PAYGo is the dominant payment form for TVs and refrigeration units, while cash is the most popular form of payment in the fans and solar water pump product categories (Figure 20). This is driven by the fact that the first two appliance types are largely sold across Sub-Saharan Africa (where PAYGo sales are significant across the off-grid industry), and the other two predominate in South Asia, in this reporting round. South Asia is composed of largely cash-based economies, fuelled by the sales of low-cost fans and, unlike the African market, mobile money - a key component enabling PAYGo - is not widely used in the region.

TVs and fans represent 93% of all the reported sales, considerably less than the 99% of the past two reporting rounds. **More nascent technologies, such as solar water pumps and refrigeration units, still represent small markets but are seeing considerable growth.** Particularly, this reporting round records a considerable increase in sales of solar water pumps, especially those purchased through cash sales in South Asia. This is due to an increase in participation from companies that sell these types of products within this region.

Meanwhile, TVs and fans benefit from greater coverage and visibility in terms of the number of countries passing the three-data point control, as their sales channels are already established in the markets, often being sold by SHS companies participating in this data collection or reported by manufacturers who stock traditional retail channels. In contrast, solar water pumps and refrigeration units have few visible data points and are available in significantly fewer markets, although we see their coverage slowly but significantly increasing as new and existing companies are creating products to meet the needs of the mass market, supported by Results Based Financing (RBF) and Research and Development (R&D) schemes.

Figure 18 – Semi-annual Evolution: Volume of Products Sold regionally - All appliances



All Off-Grid Solar Appliance Market Insights

Figure 19 - Semi-annual Evolution Volume of Products Sold per appliance type

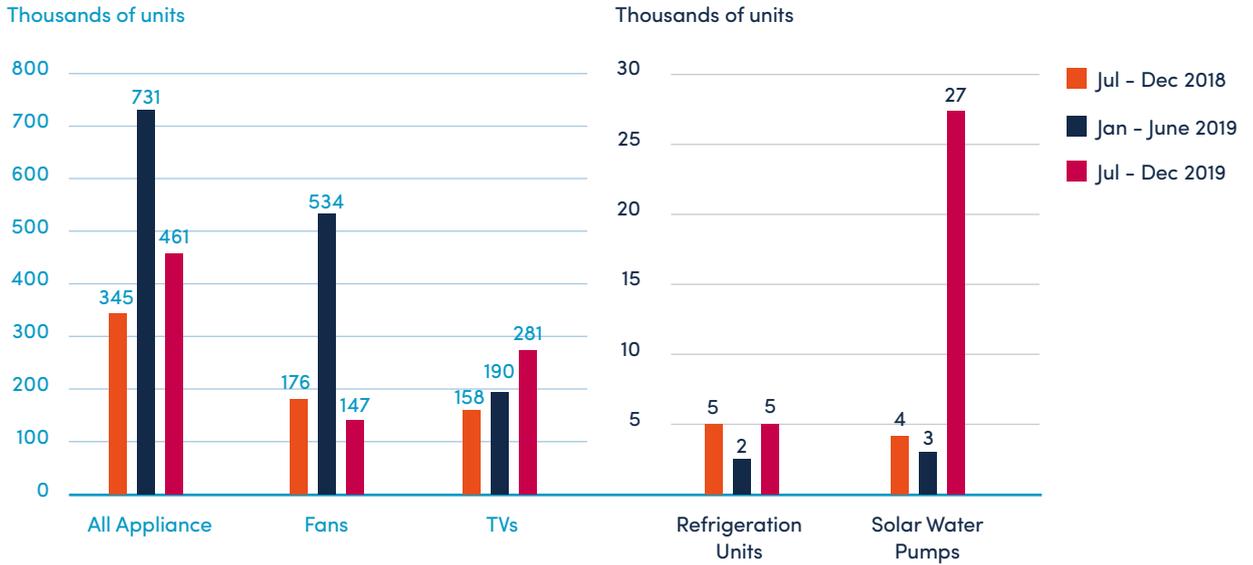
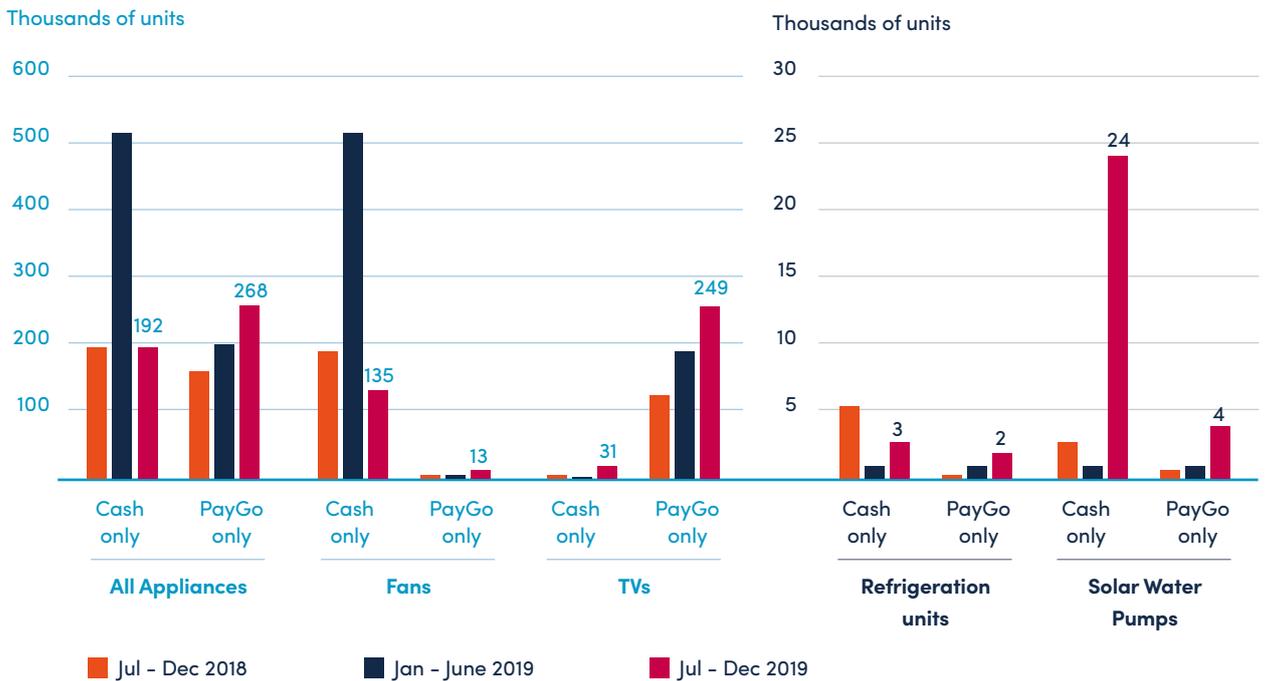


Figure 20 - Semi-annual Evolution: Volume of Products Sold with split Cash and PAYGo



NOTE:

Products are classified as "Cash" when sold in a single transaction (typically including products purchased via tenders), or as "PAYGo", when the customer pays for the product in instalments over time or pays for use of the product as a service.

All Off-Grid Solar Appliance Market Insights

Country Insights

This reporting round achieved sales visibility for appliances in 28 countries, growing from the 25 countries featured in the last round. To note, five new countries (Togo, Sierra Leone, Papua New Guinea, Mozambique and Somalia) are now visible while two lost visibility - Vanuatu and Madagascar, which registered 4,000 and 500 units sold in January-June 2019 respectively.

As Table 6 shows, the sum of all sales in a region typically exceeds the sum of all visible countries, as a lot of them register sales but do not pass the three-data point rule. Moreover, there are only two very large markets for the appliances sold by affiliates and included in this report, Kenya and Pakistan, which show sales around 100,000 units.

Kenya stands out as the largest overall market with 130,000 units of all appliances sold. This is primarily driven by the size and increases in sales

of TVs, but also refrigeration units and solar water pumps.

Pakistan takes second place with just 80,000 units, reportedly due to a seasonal decrease in sales of fans.

India is the third largest market with just over 40,000 units and visible as a result of increased participation in the country, following the data gap seen in the previous reporting round.

Further to this top three, two countries each top 20,000 unit sales of all appliances (**Cote d'Ivoire** and **DRC**) while five countries each total over 10,000 units (**Bangladesh, Nigeria, Senegal, Tanzania** and **Uganda**). As with **Pakistan**, **Bangladesh** also saw what appears to be a seasonal decrease in the sales of fans, leading to it dropping from the top five, down to 18,000 units.



All Off-Grid Solar Appliance Market Insights

Table 6 – Sales Volumes by Country – All Off-Grid Solar Appliances

Country	All Appliances Cash & PAYGo	TVs Cash & PAYGo	Fans Cash & PAYGo	Refrigeration Units Cash & PAYGo	Solar Water Pumps Cash & PAYGo
Sub-Saharan Africa	309.219	272,485	28,388	3.415	4,908
East Africa	188.974	180.198	2.034	2.474	4.245
Ethiopia	1.068				
Kenya	134.414	130.173		1.592	2.508
Malawi	2.115		0	0	
Mozambique	1.367				2
Rwanda	3.764	3.384			
Somalia	17				0
Tanzania	18.611	18.073			
Uganda	19.428	18.308	0	666	434
Zambia	7.050	6.571	285		
Zimbabwe	201	0	0	0	201
West Africa	94.830	67.355	26.181	633	661
Benin	8.577	8.155	0		
Burkina Faso	7.725	4.095			
Cote d'Ivoire	26.612	21.299	5.290	0	
Ghana	4.366			0	
Mali	3.619	2.368			0
Nigeria	18.638	6.813	11.341	234	
Senegal	12.537	9.870	2.376		287
Sierra Leone	2.006				0
Togo	7.720	7.608		0	
Central Africa	24.322	24.228		6	
Cameroon	204				0
DRC	23.909		0		0
Southern Africa	1.093	704			
South Africa	593				
South Asia	138.900	4.858	147.273	5.388	27.371
Bangladesh	18.099		13.403	0	
India	40.303	445	17.430		
Pakistan	80.398	0	79.698		
East-Asia & Pacific	10.505	3.176	6.784	545	0
Myanmar	1.182	727	55		0
Papua New Guinea	1.631	861	632		0
Philippines	5.953		5.850	0	0
Middle East & North Africa		0			0
Latin America & Caribbean	231			90	

NOTE:

Note that only an excerpt of countries is included above, excluding all the countries showing 0 sales or not passing the three-data point rule for all appliances combined. When there are fewer than three responses, no results are shown to protect the proprietary interests of the companies who have supplied data in support of this industry report. While if there are no companies reporting data at all, the graph shows a value of 0.

TVs Market Insights



There is consistent high-demand from off-grid households and businesses for TVs. The '2019 State of the Off-Grid Appliance Market Report' found that consumers view television ownership as a reflection of economic and social status, and a critical means of accessing information and entertainment.¹¹ The recent study 'Use & Impact of Solar TVs' found that 90% of solar television owners felt that their awareness of current affairs improved after purchase and 83% reported more family connection.¹²

In this section, the results presented are based on the sales of TVs by affiliates, broken down into the following product categories based on the diagonal screen size, as measured in inches:

- Small, screens between 12" and 17"
- Medium, screens between 18" and 23"
- Large, screens between 24" and 29"
- Extra Large, screens larger than 30".

Global and Regional Insights

As Figure 20 shows, TVs are predominantly sold via PAYGo - with 249,000 units sold through PAYGo channels, as opposed to 31,000 in cash. This is because the largest market for TV sales is currently in Sub-Saharan Africa where the PAYGo segment is strong, while our affiliates report limited sales in Asia.

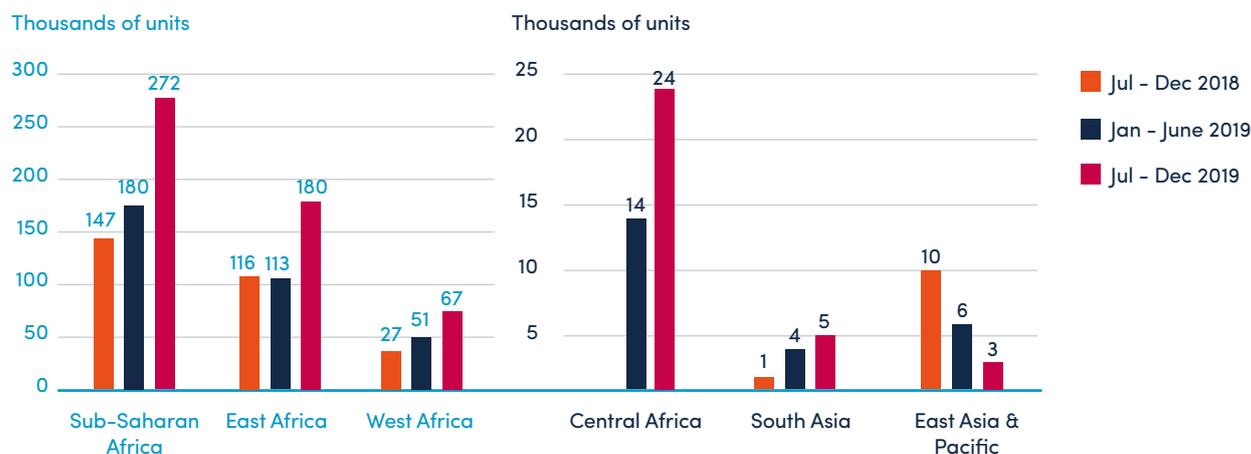
Figure 21 shows that TVs sales have generally grown round on round, registering a 47% increase worldwide in the second half of 2019 compared to the first half of the year, mostly due to Sub-Saharan Africa which saw a 51% increase. While East Africa remains the largest market for TVs, growth was reported also in West and Central Africa. This is likely due to the fact that East Africa is the most mature market for SHS sold through PAYGo business models; moreover, the market was also stimulated by the Global LEAP RBF incentives for TVs since late 2017, although the program ended in August 2019.

Anecdotally, companies in East Africa reported that the desire for TV ownership is becoming a significant driver in the household decision to purchase a SHS, typically in the 11-20 Wp and 21-49 Wp segments. Particularly, the possibility of making smaller, regular payments through PAYGo increases the affordability for many households.

South Asia saw a moderate 12% increase, remaining a marginal market for this appliance type for our affiliates with only 5,000 units sold.

East Asia and Pacific is the only region registering a decrease in sales; though it is a significant drop of 51%, the absolute sales are only 3,000 units for the current reporting round.

Figure 21 - Semi-annual Evolution: Volume of Products Sold regionally – TVs



11 Efficiency for Access Coalition, 2019 State of the Off-Grid Solar Market Report, 2019. Full report here: <https://efficiencyforaccess.org/publications/2019-state-of-the-off-grid-appliance-market-report>

12 Efficiency for Access Coalition, Use and Impact of Solar TVs, 2020. Full report here: https://storage.googleapis.com/e4a-website-assets/Solar-TV-Report_-_FINAL.pdf

TVs Market Insights

Insights by Product Category

In terms of the diversity of product categories, **the majority of TVs sold seem to fall in the large and medium categories** as shown in Figure 22. This trend is highly influenced by the data seen in East Africa, as it is the largest market. However, the same can be seen across all regions, with the gap between the large and the medium TVs narrowing in West Africa, where large TVs make up 48% of the total and medium TVs account for 34%.

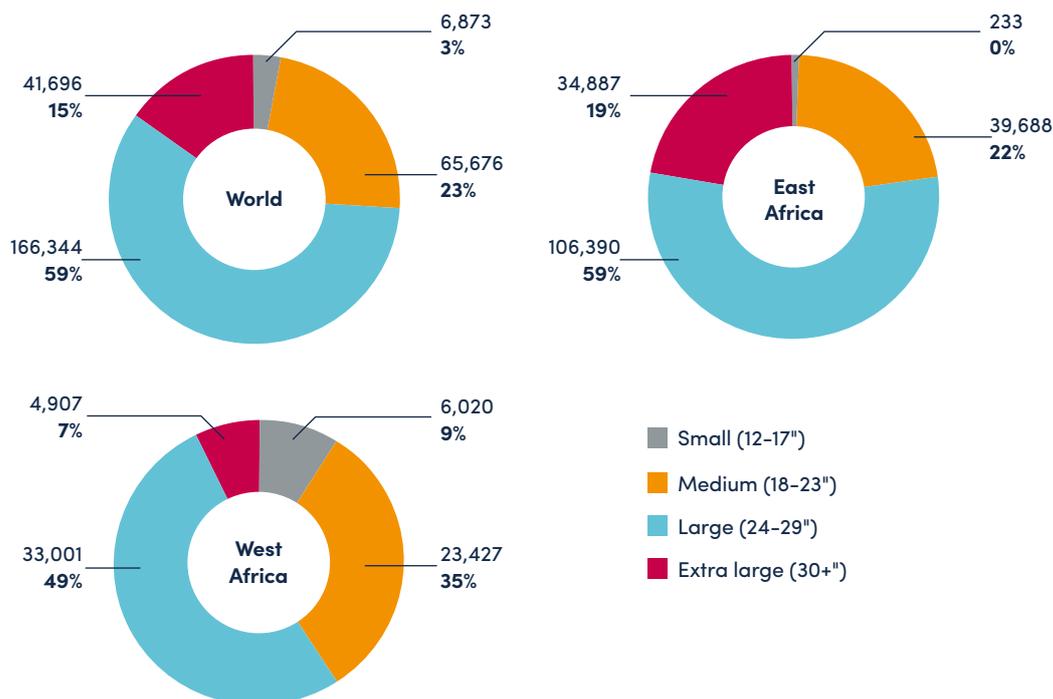
Large TVs contributed the most to the growth of this segment, with volumes reaching almost 170,000 units, showing a great increase from the 110,000 of last round. Similarly, extra large TVs saw significant growth - from 13,000 units to over 40,000 - and medium TVs saw moderate growth from 60,000 to 65,000. In this round, sales of small TVs was the only category seeing a decrease, from 7,500 to less than 7,000 units.

It is interesting to note that small TVs are mostly sold in West Africa, with virtually no other region showing demand for these smaller appliances.

A possible explanation for small TVs not taking a commanding share of the market is that more market leaders are offering high-quality and highly efficient medium and large TVs. **These larger sized TVs are becoming so efficient that the power consumption difference between large TVs and small TVs are fairly minimal.** For example, based on testing of one of the GOGLA affiliate's TVs, the large 24" TV is 63% more efficient than the small 16" TV - and thus the power consumption difference between its 24" TV and 16" TV is only 3W. This makes it possible for consumers to upgrade to larger TVs without putting a significant investment in expanding solar panels and battery capacity. This can be observed in the Efficiency for Access Coalition's Equip Data platform containing performance specifications from over 140 off-grid solar TVs.¹³

Other drivers for customer behaviours in this category are social influences. Such as the fact that a larger TV can benefit a larger group of people at a time, and are more likely to be used for commercial, as well as domestic purposes. There is also a perception that a larger TV could display a higher social status.

Figure 22 - Volume of Products Sold by Product Category - TVs



NOTE:

Only regions where all categories pass the three-data point rule are shown in the graph, meaning three or more separate manufacturers reported data.

TVs Market Insights

Country Insights

A total of fifteen countries passed the three-data point control for TV sales. **Sales overall record increases for all countries in Sub-Saharan Africa**, mirroring the increases observed for SHS in the 11-20 and 21-49 Wp which reached unprecedented levels.

Kenya remains the largest market worldwide, accounting for 46% of all reported TVs sold, seeing a 76% increase. The country with its 130,000 units makes up 50% of the sales of the whole of Sub-Saharan Africa and 60% of the sales in all of East Africa. This is consistent with the large increase experienced in the country in the 11-20 Wp and 21-49 Wp categories (respectively 108% and 21%), suggesting that most of those systems were sold bundled with TVs by the reporting companies. **Cote d'Ivoire** establishes itself as the second largest TVs market, even with much smaller volumes of around 20,000 units sold this reporting round. A growth of 13% was witnessed in the country.

The third largest market is contended by **Tanzania** and **Uganda** as both register around 18,000 TVs sold between Jul-Dec 2019. Uganda boasts the larger percentage growth of the two, with 31% increase on its volumes from Jan-June 2019. As noted by companies operating in this country, this is possibly due to the fact that the second half of the year records higher sales than the first half for all off-grid solar products; in fact, these volumes are very similar to the ones registered in the second half of 2018. Tanzania observed a 19% growth compared to the first half of 2019, following also the growth recorded in the 11-20 Wp and 21-49 Wp SHS segments (respectively 260% and 80%). An important driver of these sales has been identified as the second stage of development organisation SNV's results-based financing (RBF) initiative, being rolled out in the country to foster PAYGo sales of SHS; however, the overall market situation remains uncertain due to the legislation of the Tanzania Microfinance Act 2018, the impact of which is yet to be fully clarified as it could have significant influence on the sector if it is deemed to apply to PAYGo organisations and their operations.

Nigeria's sales observed the largest percentage increase (534%) to reach almost 7,000 units sold. Sales could have been influenced by a countrywide results-based financing initiative for SHS, the World Bank funded government led Nigeria Electrification Project. This output-based financing provides grants to companies for delivering a minimum number of SHS connections every quarter, which are likely to include TVs. The 11-20 Wp and 21-49 SHS segments have witnessed respectively a 42% and 167% growth in Nigeria.

Zambia also recorded an 85% increase, reaching 6,500 units sold. Sales are likely to be influenced by USAID's Beyond the Grid Fund, which continues to drive growth in the country market. In addition to this, the number of new companies entering the market continues to grow.

Senegal reports stable sales of TVs reaching nearly 10,000 units. An apparent seasonal trend was detected which sees the first half of the year report higher volumes, when the harvesting season occurs.

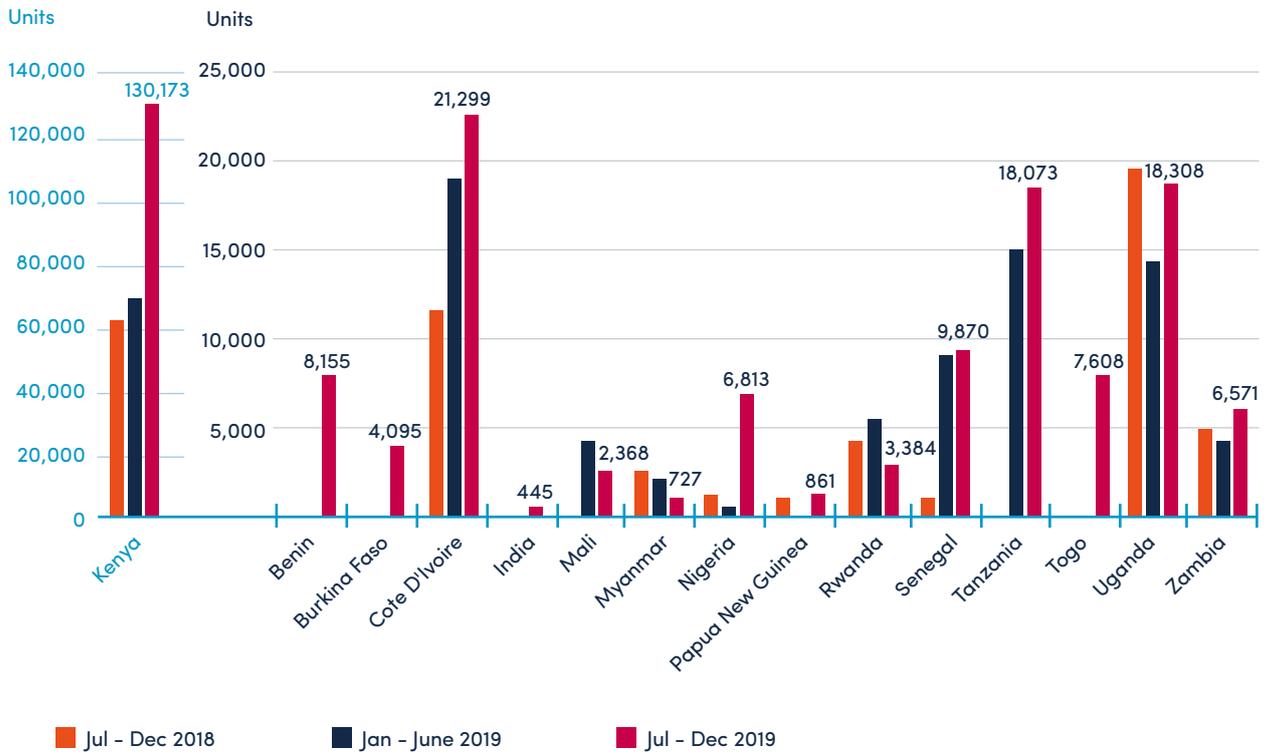
Only **Mali** and **Rwanda** show slight decreases for TVs sales in this region, decreasing to 2,000 and 3,000 units respectively. This mirrors the decreases observed in both countries for lighting products, suggesting that the decrease is likely not due to fluctuations in demand for specific appliances, but rather specific situations affecting overall sales in the country.

Greater visibility was gained in West Africa with **Benin, Burkina Faso** and **Togo** passing the three-data point rule due to increased activity of affiliates in the region. All these markets see considerably large sales volumes with respectively 8,000, 4,000 and 7,500 units sold in the reporting period.

No Asian country has more than 1,000 reported sales - India totals 445 units, 727 in Myanmar and 861 in Papua New Guinea. This is likely a result of the generally higher rates of grid-electrification, and therefore more of a market for alternating current (AC) TVs which are outside of the scope of this data collection.

TVs Market Insights

Figure 23 - Semi-annual Evolution: Volume of Products Sold per country– TVs



NOTE:

Countries that did not pass the three-data point rule for the current round have not been included in the graph. For past rounds, where less than three manufacturers are reporting, we are showing an empty bar. While if there are no companies reporting data at all, the graph shows a "0".



Fans Market Insights



Air conditioners remain too expensive for rural off-grid households and use too much energy to be supported by SHS.¹⁴ **Fans are therefore, currently, the most feasible and cost-efficient means of cooling that is within reach for households in hot and humid climates.**¹⁵ They provide a crucial and potentially life-saving resource in South Asia, across a considerable portion of West Africa and in many countries in East Asia and Pacific.

Results are presented in this subsection based on the sales of fans by affiliates. Sales are broken down in the following three product categories, further categorised based on the diameter in inches where possible:

- Table fan, a smaller-diameter propeller-bladed fan having two or more blades and intended for use with free inlet and outlet of air. Although these are almost wholly free-standing on a table, they may also be bracket-mounted for wall or ceiling mounting.
- Pedestal fan, a propeller-bladed fan having two or more blades mounted on a pedestal of fixed or variable height and intended for use with free inlet and outlet of air.
- Ceiling fan, a propeller-bladed fan having two or more blades with a device for suspension from the ceiling of a room so that the blades rotate in a horizontal plane.

Global and Regional Insights

In terms of global sales, **the majority of fans were sold on a cash basis** as outlined in Figure 20. The lower price of the technology, relative to other off-grid solar appliances, typically enables rural customers to buy fans without requiring consumer financing.

This trend largely reflects the overall situation in South Asia, even if specific insights regarding cash/PAYGo data are not available due to less than three companies reporting on the PAYGo segment. The predominance of cash sales also reflects the significance of sales in established markets in this region, where both grid-connected and off-grid fan products are sold over the counter through household electrical goods retailers and component-based solar retailers.

Cash sales of fans are also widely spread across Sub-Saharan Africa representing 83% of the total. This means that they are likely sold outside of the usual SHS kits which are, in most cases, sold through PAYGo transactions.

Compared to the previous reporting round, **overall sales of fans have decreased in South Asia, the largest regional market, registering a significant decrease of 78% compared to last round.** This is not due to decreased participation, but rather a seasonal pattern - highlighted anecdotally by the companies. They shared an observed seasonal pattern in South Asia, whereby sales are run through a pre-booking system causing distributors to purchase fans in bulk quantity early in the year and then selling them to end-users from March onwards. This would cause the sales of the first half year to be consistently larger than the second one.

Moreover, companies shared that in Bangladesh the prices of direct current (DC) fans for the past two years were lowered thanks to a RBF scheme within the IDCOL programme, which has incentivised the sales of SHS and bundled appliances but has since run its course. Therefore, it is possible that sales volumes will struggle to reach the record reported last round.

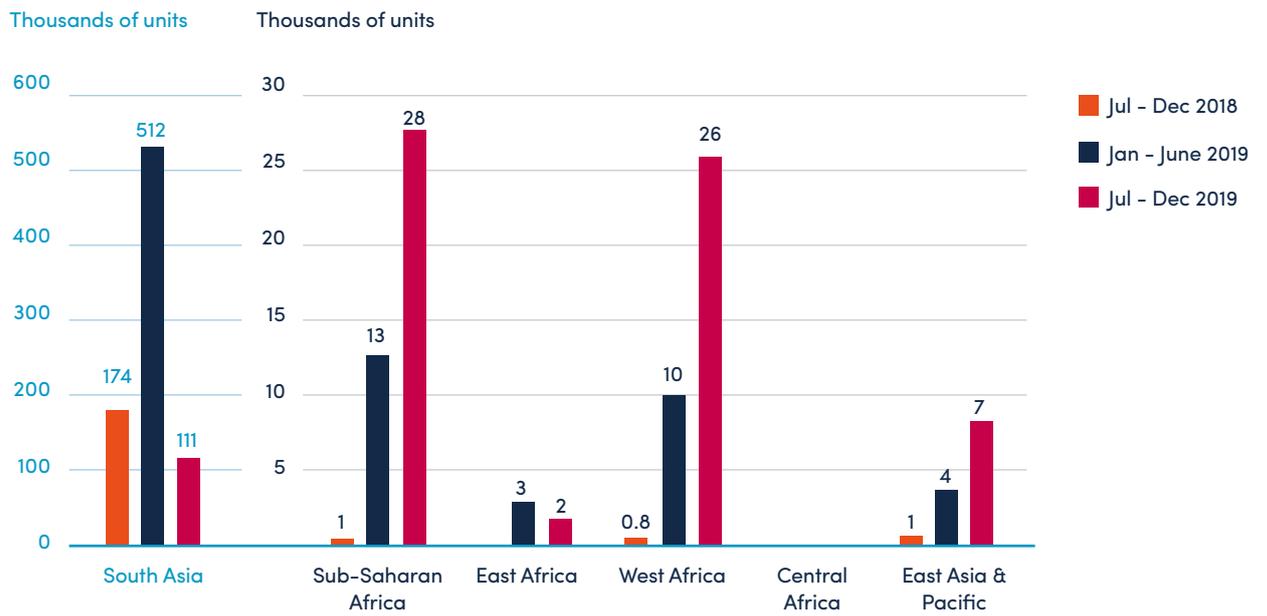
Meanwhile, **sales have doubled in Sub-Saharan Africa, reaching almost 30,000 units.** All of this growth is registered as cash transactions, while PAYGo sales remain stable. Sales of fans are predominantly happening in West Africa, where the humid climate conditions drive demand for fans. The vast majority of East Africa enjoys more mild climate conditions and consequently demand is smaller. However, this can vary dramatically in specific areas of certain countries, for example the coastal regions of Kenya and Tanzania, and could be exacerbated by climate change in the coming years.

14 Efficiency for Access Coalition, Off-Grid Fan Quality Testing in Pakistan, 2019. Full article here: <https://medium.com/efficiency-for-access/off-grid-fan-quality-testing-in-pakistan-fce8364721e0>

15 Efficiency for Access Coalition, 2019 State of the Off-Grid Solar Market Report, 2019. Full report here: <https://efficiencyforaccess.org/publications/2019-state-of-the-off-grid-appliance-market-report>

Fans Market Insights

Figure 24 - Semi-annual Evolution: Volume of Products Sold regionally – Fans



Fans Market Insights

Insights by Product Category

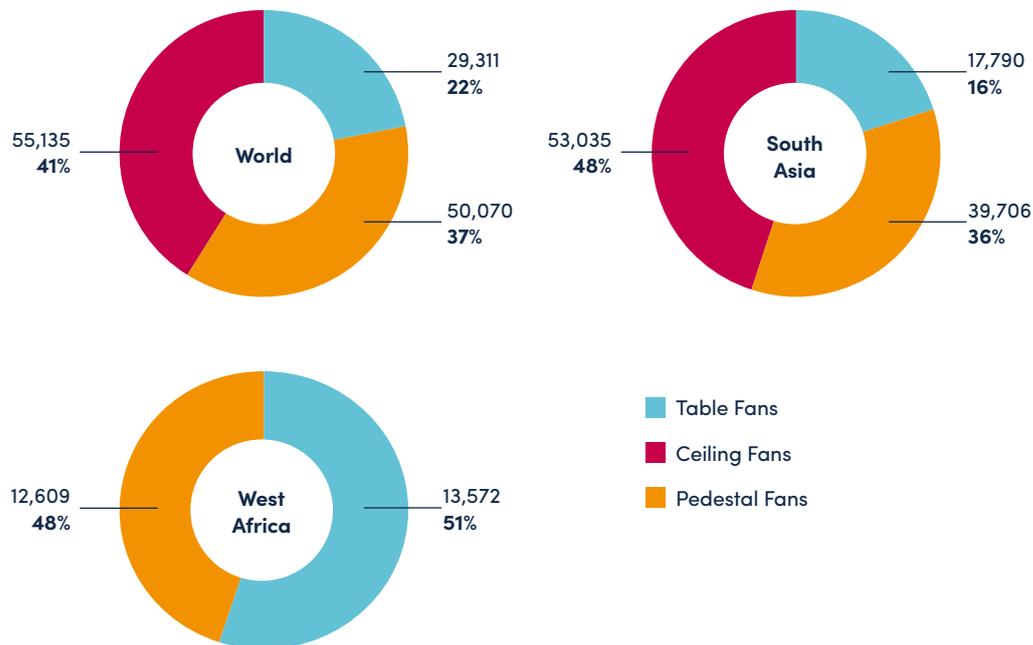
In terms of the portfolio of product categories sold, Figure 25 shows that **ceiling fans comprise 41% of the global market share; pedestal fans follow with 37% and lastly table fans take 22% of the market share.**

However, this trend does not translate into the **West African market, where table fans are the most popular category, with 52% of the total sales.** The region shows similar sales volumes of pedestal fans; this means that ceiling fans account for very few of the total sales. Anecdotally, the prevalence of ceiling fans can be seen to map to the more mature markets for AC products which have diversified to produce DC fans to meet growing off-grid market demand, this can be seen particularly in South Asia, where it applies to Bangladesh, India and Pakistan.

Compared to the volumes recorded in the last reporting round, the category that witnessed the largest absolute decrease is ceiling fans which fell dramatically from 350,000 units to just 55,000. However table fans and pedestal fans also recorded proportional decreases.

Still 100% of the table fans sales fall in the large category, meaning that they have a diameter larger than 12". The vast majority of ceiling fans - 94% - also fall in the large category, with a diameter larger than 48". There is not an indication of size for pedestal fans, as they all roughly all have around 18" diameter.

Figure 25 - Volume of Products Sold by Product Category - Fans



NOTE:

Only regions where all categories pass the three-data point rule are shown in the graph, meaning at least three separate manufacturers reporting data.

Fans Market Insights

Country Insights

Ten country markets for fans satisfy the three-data point rule, with greater visibility gained outside of South Asia.

Pakistan remains the largest market worldwide with nearly 80,000 units, accounting for 54% of all the reported fan sales, although the overall number of sales tumbled and saw a 79% decrease. This is connected to the aforementioned decreases experienced in the South Asia region, with shipment to distributors concentrated in the first three months of the year. Also in the off-grid lighting category, decreases have been recorded, possibly as a result of the 50% decrease in the value of the rupee which occurred between January 2018 and June 2019.

Moderate increases have been observed in **India** with a slight boost of 15% which made it reach nearly 18,000 units. This is in line with what companies shared regarding the market: consumer demand is shifting from lanterns towards SHS which are capable of powering appliances. Moreover, increased participation from manufacturers and distributors closed the data gap highlighted in the last reporting round; yet more participation will still need to be leveraged in order to capture a more detailed picture of market activity in the country.

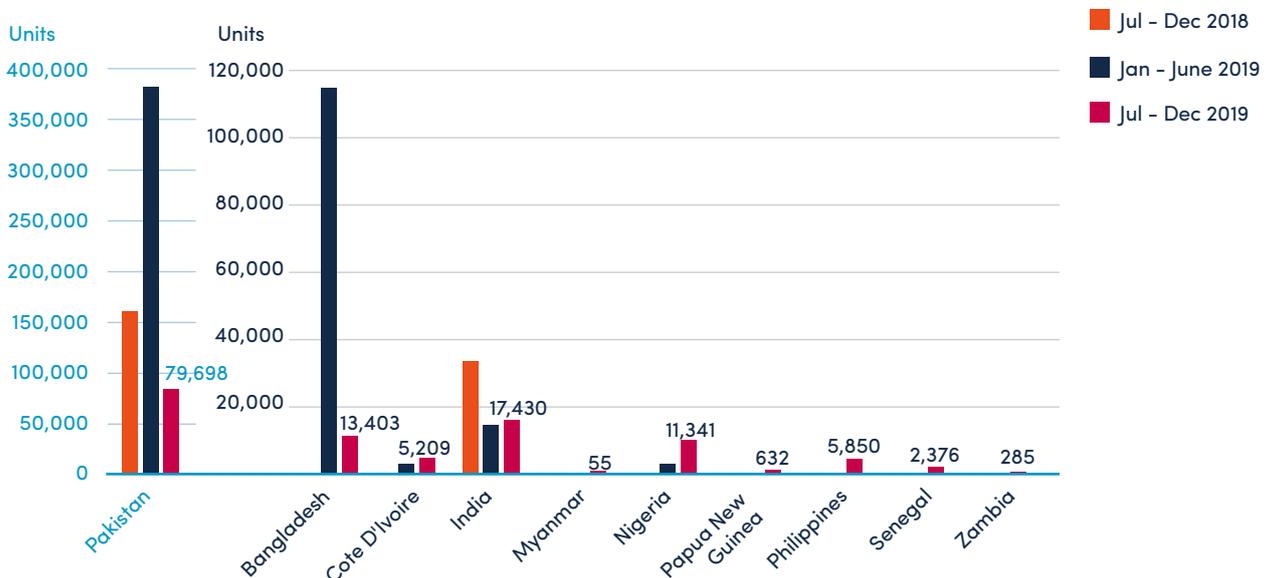
Bangladesh saw a very dramatic decrease in sales of 88% reporting only 13,403 units sold, seeing the country fall from its position as the

second largest country market for fans in the region. This is connected to the aforementioned decreases across the South Asia region, attributed to distributor's shipment schedules. Moreover, companies shared that in Bangladesh the prices of DC fans for the past two years had become more affordable thanks to a RBF scheme connected to the IDCOL programme, which has now stopped. It is possible that sales volumes in the future will struggle to reach the record reported last round.

Overall sales increases were registered for **Cote d'Ivoire** and **Nigeria** (respectively 5,000 and 11,000 units sold), with the latter recording a particularly large sales increase of 170%. Since the majority of these sales are made on a cash basis, no conclusion can be drawn in connection with the sales of PAYGo SHS.

Greater visibility was gained in East and West Africa, with **Zambia** and **Senegal** passing the three-data point rule due to increased activity of affiliates in the region. Senegal represents a larger market with over 2,000 fans sold, while Zambia only records a couple of hundreds. The same occurs for Myanmar, Papua New Guinea and The Philippines where climate conditions stimulate the sales of fans. The Philippines recorded almost 6,000 units sold, while Papua New Guinea less than a 1,000 and Myanmar barely passed the 50 units mark.

Figure 26 - Semi-annual Evolution: Volume of Products Sold per country – Fans



NOTE:

Countries that did not pass the three-data point rule for the current round have not been included in the graph. For past rounds, where less than three manufacturers are reporting, we are showing an empty bar. While if there are no companies reporting data at all, the graph shows a "0". 54

Refrigeration Units Market Insights



To date, off-grid refrigeration units (RUs) have had a very low penetration rate, and this report confirms small but growing sales volumes. This however does not speak to their transformative power for the households and enterprises where they are being used. **RUs not only preserve food and produce, they can also be used as productive appliances to generate income for small businesses.** The '2019 State of the Off-Grid Appliance Market Report' showed, for instance, that in Uganda micro and small enterprises who had purchased off-grid refrigerators, increased their daily incomes 2.5-fold on average (from USD29 to USD 70); half of these enterprises used the off-grid refrigerators to expand into new business lines (i.e., food and drink sales).¹⁶

Yet various barriers remain to developing commercial markets for RUs at the household and micro enterprise level. This includes a lack of affordable products and access to customer financing, the high cost of energy supply, and difficulty of last-mile transportation.

Generally, RUs are designed to have one or both of the following types of compartments:

- Fresh-food compartments, defined as a compartment for the storage and preservation of unfrozen food and beverages, where the storage temperature is between +2°C and +8°C.
- Freezer compartments, defined as a compartment for the storage and preservation of frozen food and beverages where the storage temperature is not warmer than -6°C.

This subsection presents sales of RUs by reporting affiliates, broken down into the following three product categories, and further segmented based on their refrigerated volume capacity in litres where possible:

- Refrigerators: with one or more fresh food or vaccine compartments.
- Refrigerator-Freezer Combination Units: with at least one fresh food compartment and at least one freezer compartment.
- Multi-Temperature Refrigerator: with one or more compartments that can be operated either as a refrigerator or freezer by adjusting the thermostat control.

Global, Regional and Countries Insights

New and existing companies are adapting current RU designs to meet the needs of the mass market and establishing partnerships with distributors.

Companies are leveraging their own off-grid solar system sales in addition to the distribution, finance and after-sales infrastructure to accelerate access. **This is reflected in the increased numbers of RUs (over 5,000 units) sold in this second half of the year - with a marked increase of 95% compared to the first half of 2019.**

Note that the sales in Jul-Dec 2018 were higher, due to volumes anecdotally attributed to institutional sales providing vaccine preservation in West Africa. Refrigerators used for such purposes fell in the same category as those for use in domestic or small commercial applications, making the distinction virtually impossible. It is important to note that at the time these sales occurred there was no coverage of the whole market of sales for vaccine preservation, but even capturing a small part of this biased our reported sales volumes. This demonstrates how important such a market is in comparison with the current nascent market usage by households or small businesses.

As Figure 20 shows, **sales of RUs increased for both cash and PAYGo, with almost a 50-50 split of sales.** Cash sales still remain the majority, by a small margin. The cash sales for RUs consist largely of institutional sales which typically fluctuate from each half year and seem concentrated in South Asia and East Asia and Pacific regions. Sub-Saharan Africa is instead dominated by PAYGo volumes, representing 72% of the sales total.

The increase of the PAYGo segment and the sales in Sub-Saharan Africa - representing 63% of the global sales - is due to the increased number of companies involved in this segment. **The sales volumes increased mainly due to the impressive 113% growth in East Africa, while Central and West Africa recorded small decreases.** Besides the number of companies involved, another factor that has influenced the PAYGo segment for RUs is the 2019-20 Global LEAP Results Based Financing (RBF) incentives for the procurement of best-in-class RUs identified as Winners or Finalists

¹⁶ Efficiency for Access Coalition, 2019 State of the Off-Grid Solar Market Report, 2019. Full report here: <https://efficiencyforaccess.org/publications/2019-state-of-the-off-grid-appliance-market-report>

Refrigeration Units Market Insights

of the 2019 Global LEAP Awards in Bangladesh, Kenya, Tanzania, Rwanda, Uganda.¹⁷ This began in October 2019 and plans to run at least until November 2020, so this will likely continue influencing sales in the coming rounds.

No sales under the RBFs have been collected in Bangladesh through the data collection for this reporting round. However, **sales in South Asia have increased significantly, reaching over 1,000 units.** This is likely due to increased participation of other countries in the region.

For the first time, East Asia and Pacific and Latin America pass the three-data point rule, with each region reporting a few hundred units sold. As such, it is not possible to make any solid observations on the landscape of the market for these regions yet.

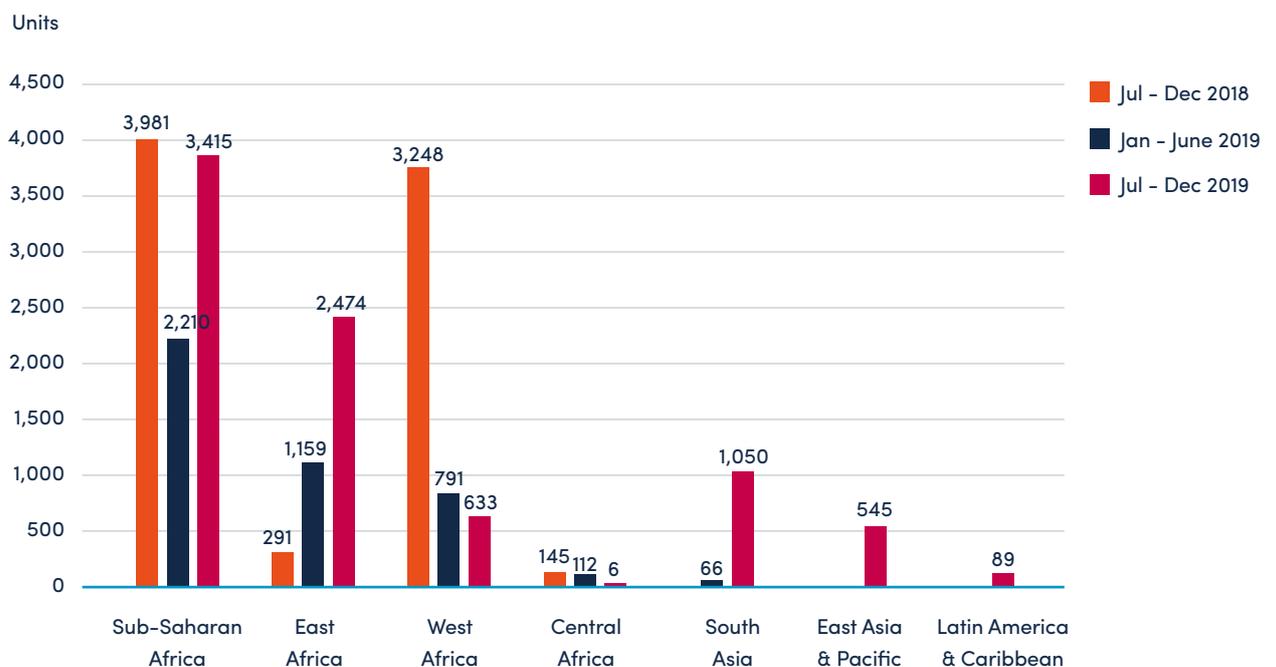
In terms of product category diversity, **refrigerators still dominate, representing 82% of the global sales for all RUs categories.** In this round, the only category that passed the three-data point rule is the large refrigerators

- with a capacity of 100+ litres - with 1,773 units sold. Other categories of fridge sizes are not visible at this stage. Therefore it's not possible to state which category records the most overall sales. Meanwhile sales of refrigerator-freezer combination units remain marginal with only 860 units. Sales of multi-temperature refrigerators do not satisfy the three-data point rule. Sales of freezers remain at 0.

In Figure 28, the visibility per country remains limited, with only Kenya and Uganda showing some kind of market evolution, satisfying the minimum three-data points for company participation in each round.

Although the absolute volume of sales remains low, **Kenya** in particular shows fantastic 260% growth this reporting round, reaching 1,500 units sold. **Uganda** shows a 120% growth reaching over 600 units sold. For the first time we can also see the sales in **Nigeria**, which records only a few hundred units. As the market for RUs evolves, more country markets should pass the three-data point rule and appear in the reported results.

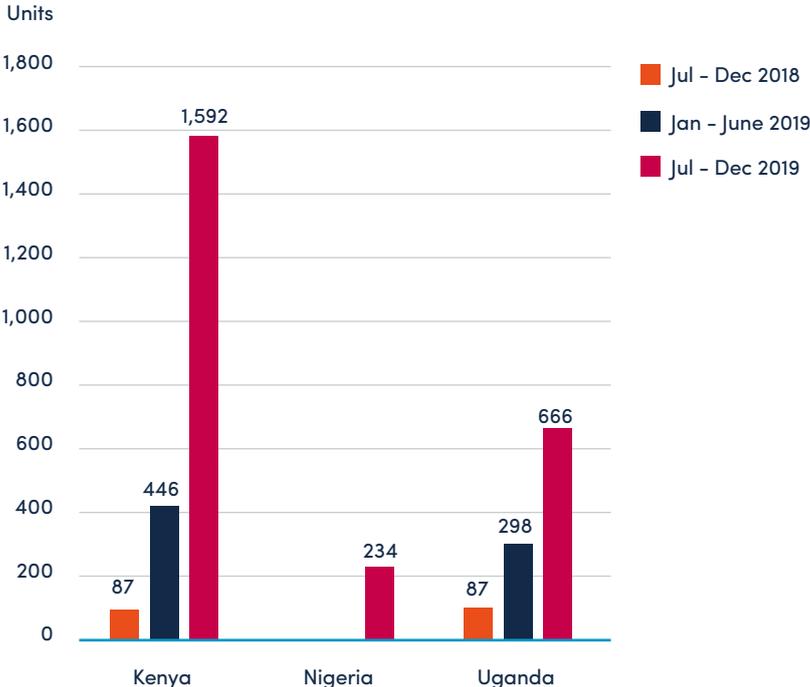
Figure 27 - Semi-annual Evolution: Volume of Products Sold regionally – Refrigeration Units



¹⁷ Global Leap Awards, Results-based financing. 2019-20 - Refrigerators & Solar Water Pumps, 2019. Full article here: <https://globe-leapawards.org/results-based-financing>

Refrigeration Units Market Insights

Figure 28 - Semi-annual Evolution: Volume of Products Sold per country – Refrigeration Units



NOTE: Countries that did not pass the three-data point rule for the current round have not been included in the graph. For past rounds, where less than three manufacturers are reporting, we are showing an empty bar. While if there are no companies reporting data at all, the graph shows a '0'.

Refrigeration Units Market Insights



Solar Water Pumps Market Insights



The agricultural sector employs 40% of the world's population. Many of the world's smallholder farmers, especially those in remote locations, have no access to energy and often restricted access to water. **Approximately 95% of the land in Sub-Saharan Africa and 60% of the land in South Asia relies on unpredictable seasonal rainfall to meet irrigation needs.**¹⁸ **Solar water pumps can increase agricultural yields by as much as two to three fold, depending on the crop and climate.** A report from the Efficiency for Access Coalition estimates the total addressable market for small-scale solar water pumps in sub-Saharan Africa and India is \$15.6 billion, representing 4.9 million units.¹⁹

All evidence indicates that sales numbers are suppressed due to barriers to the development of commercial markets for the sales of solar water pumps at the smallholder farmer and micro-enterprise level. Principal among these are lack of affordable products and consumer financing, low awareness and availability of technology local to intended users, water scarcity, and complexity of use of this technology, among others.²⁰

This subsection presents the affiliates sales of eligible solar water pumps. Unlike other off-grid solar appliances in this report, these are not broken down with further product categorisation as those within this report's remit are not currently being sold in sufficient volumes to be reported due to our confidentiality rule.

Global, Regional and Countries Insights

Like in the RUs segment, **new and existing companies are evolving and adapting current designs to meet the needs of the mass market and establishing partnerships with distributors** to accelerate access. This is reflected in the increased numbers of solar water pumps sold in this second half of the year, which reached over 27,000 units sold.

However, **this data point is mainly driven by the dramatic growth observed in South Asia, which jumped from a few hundred units to over 20,000 this reporting round** as visible in Figure 29. This

is likely due to the increased participation from companies operating in the region, as well as government-led schemes subsidising the sales of solar water pumps in India. However, no country in South Asia passes the three-data point rule to validate this statement.

Looking at Figure 20, **global sales of solar water pumps are predominantly cash sales, but this insight is mainly driven by the sales in South Asia** where cash represents 100% of the total sales. **In Sub-Saharan Africa, PAYGo sales represent over 70% of the total**, as it did in the previous reporting round.

The increase of the PAYGo segment and the overall volume of sales in Sub-Saharan Africa is largely reflective of the increased number of companies involved. Another factor that has influenced the PAYGo section of this segment is the 2019-20 Global LEAP Results Based Financing (RBF) incentives for the procurement of best-in-class solar water pumps identified as Winners or Finalists of the 2019 Global LEAP Awards in Bangladesh, Kenya, Tanzania, Rwanda, Uganda, and Senegal.²¹ This began in October 2019 and is planned to run at least until November 2020, so it will likely continue to influence sales in the coming rounds.

Sub-Saharan Africa has seen a sharp 70% increase in sales volumes, due to the increases observed in East Africa of 76%. West Africa still records small volumes. Central Africa still presents 0 sales meaning that there are no affiliate companies yet selling these products in the region.

A similar occurrence is true for East Asia and Pacific where 0 sales have been reported this round, after not passing the three-data point rule the previous rounds. This may mean that there are occasionally products being sold in the region, but no affiliates are yet consistently engaging in local distribution.

As was reported for RUs, solar water pumps visibility at country level remains limited. There

18 GOGLA, How solar water pumps are pushing sustainable irrigation, 2019. Full article here: <https://www.gogla.org/about-us/blogs/how-solar-water-pumps-are-pushing-sustainable-irrigation?platform=hootsuite>

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21 Global Leap Awards, Results-based financing. 2019-20 - Refrigerators & Solar Water Pumps, 2019. Full article here: <https://globe-leapawards.org/results-based-financing>

Solar Water Pumps Market Insights

is no single country with more than two data points over time, which means that there are no observable trends to date.

Kenya remains a large market for solar water pumps, recording a 60% increase and reaching over 2,500 units. In general, Kenya constitutes 50% of all solar water pumps sales in Sub-Saharan Africa. **Uganda** had a more modest increase with

sales stable at around 500 units. For the first time, sales in **Senegal** pass the three-data point rule, showing a few hundred units sold.

No country in South Asia passed the three-data point rule, therefore the sales within the region cannot be allocated or analysed. As the market evolves, more trends and analysis will be made possible by increased reporting and participation across the regions.

Figure 29 - Semi-annual Evolution: Volume of Products Sold regionally – Solar Water Pumps

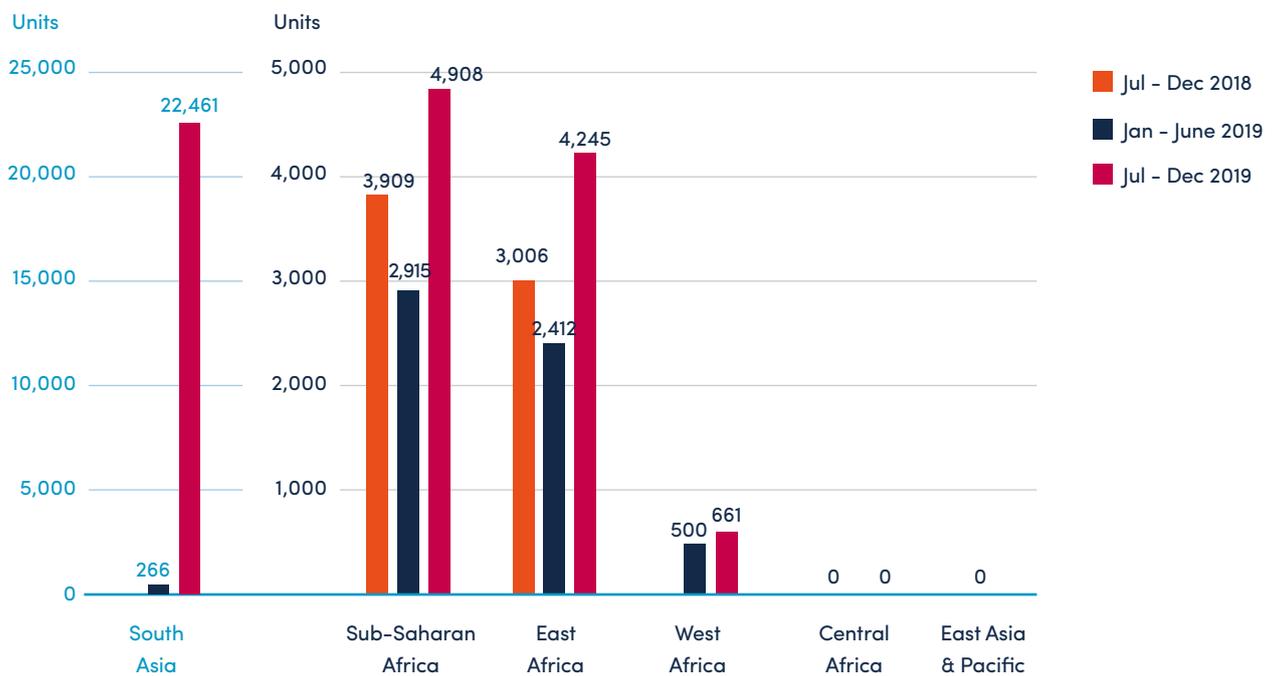


Figure 30 - Semi-annual Evolution: Volume of Products Sold per country – Solar Water Pumps





Impact Metrics



Introduction to Impact Metrics

Impact is calculated using the Standardised Impact Metrics for the Off-Grid Solar Energy Sector.²² These metrics were first launched in 2015 and recently revised in April 2020. They provide a framework for the off-grid solar sector to collectively estimate social, economic and environmental impact in a consistent and comparable way.

The metrics help build the evidence base for the many benefits that off-grid solar lighting products and services unlock for people previously living in energy poverty. These include unlocking financial savings, generating additional income, and using the light hours to work, study or spend time with family.

Methodology

Each impact metric in this report combines relevant company data, such as sales and product characteristics, with coefficients and default values. The default values of the coefficients have been developed by the GOGLA Impact Working Group, a body of industry practitioners and academic observers. They incorporate findings from a review of publicly available data and research, data made available by participating companies, and by the application of informed assumptions and calculations. The metrics have been reviewed by external experts and are aligned with the IRIS impact metrics.²³

The impact estimates for this reporting round were calculated by applying these standardised impact metrics to the off-grid solar lighting products sales reported by affiliates. The impact of sales between July and December 2019, as well as all sales of off-grid solar lighting products reported by participating companies in previous reports since July 2010, are included in these calculations.

Please note that impact created by off-grid solar appliances is not included in this section as metrics have not yet been created for this segment; the impacts detailed refer only to the impact of off-grid solar products. Efforts are underway to create impact metrics for appliances in the coming years.

The following pages present the aggregated impact estimates of affiliates. This matrix of companies includes GOGLA members, companies selling products that meet Lighting Global Quality Standards, and appliance companies that participated in the Global LEAP Awards or are engaging with the Low Energy Inclusive Appliances (LEIA) programme. To avoid double-counting, the results are only drawn from data provided by manufacturers.

Limitations

This report estimates the impact made by participating companies. **Therefore, while the numbers shown represent the aggregate impact of key players in the off-grid solar sector, this report does not present an estimate of the overall global impact of off-grid solar lighting products sold outside the scope of this report for this reporting period.**

This report takes a conservative approach to data inclusion and may underestimate the total impact of participating companies. For example, to estimate when a product reaches its end of life, 1.5x its warranty period is used. This means that no impact is attributed to a product after that time. However, it is possible that a significant number of these products are continuing to benefit households beyond this estimated period. In addition, if companies have not provided all the product specifications needed for a particular impact metric, such as lumen output or runtime, the product is not included in the analysis for that metric.

Please note that the current approach is based on best available research information and data. All metrics used to create the impact numbers in this paper, as well as the default values and definitions including the methodology and sources, can be found in the GOGLA Standardised Impact Metrics for the Off-Grid Solar Energy Sector.²⁴ **Please note that all numbers calculated using the metrics should be expressed as estimates.**

22 GOGLA, Standardised Impact Metrics for the Off-Grid Solar Energy Sector, Version 4.0, 2020. Full report here: www.gogla.org/gogla-impact-metrics

23 IRIS+, The Global Impact Investing Network Impact Toolkit. For more information, please visit: <https://impacttoolkit.thegiin.org/>

24 GOGLA, Standardised Impact Metrics for the Off-Grid Solar Energy Sector, Version 4.0, 2020. Full report here: www.gogla.org/gogla-impact-metrics

Introduction to Impact Metrics

List of Impact Metrics

The following table gives an overview of all the metrics for which the estimated results are presented in this report.

1ai.	Number of people with improved energy access, cumulatively Cumulative number of people who have ever lived in a household with improved energy access (as a result of access to off-grid solar)
1a.ii.	Number of people with improved energy access, currently Number of people who currently live in a household with improved energy access (as a result of access to off-grid solar)
1bi.	Number of people with access to Tier 1 energy services Number of people who currently access Tier 1 energy services, based on the Sustainable Energy for All Global Tracking Framework (as a result of access to off-grid solar)
1b.ii.	Number of people with access to Tier 2 energy services Number of people who currently access Tier 2 energy services, based on the Sustainable Energy for All Global Tracking Framework (as a result of access to off-grid solar)
2a.	Number of people undertaking more economic activity Number of people who are currently undertaking more economic activity as a result of using off-grid solar
2b.	Number of people using products to support enterprise Number of customers using their system to support an enterprise or income generating activities e.g. charging phones for a fee or operating a bar, restaurant or shop/stall at night
2c.	Number of people that spend more time working Number of customers spending more time working as a result of using off-grid solar e.g. as a household member can shift tasks to the evening time as a result of increased light hours or as they spend less time travelling to buy fuel – unlocking time for work
3b.	Additional income generated, cumulatively Cumulative amount of additional income generated as a result of off-grid system ownership; generated over the expected lifetime of the solar products
4.	Kerosene lanterns replaced Number of kerosene lanterns no longer in use because users have replaced them with solar lighting
5.	CO₂e emissions avoided Metric tons of CO ₂ and black carbon averted due to reduction in kerosene use (in CO ₂ e) over expected lifetime of all solar products
6ai.	Additional light hours used, by household Average additional hours of light usage, per household; over the expected lifetime of their solar product
6a.ii.	Additional light hours used, cumulatively Cumulative number of additional light hours used by all households; over the expected lifetime of their solar products
6b.	Change in quality of light, by household Change in lumens of light used, per household (on average)
7ai.	Savings on energy expenditure, by household (solar lanterns and multi-light systems <11Wp only) Amount of US\$ savings on energy-related expenditure, per household; over expected lifetime of solar product
7a.ii.	Savings on energy expenditure, cumulatively (solar lanterns and multi-light systems <11Wp only) Amount of US\$ savings on energy-related expenditure, in aggregate of all sales ever; over the expected lifetime of products

NOTE:

In this context, 'improved' is used to reflect lighting and energy provided by appropriate (less expensive, less harmful, better quality) technologies such as solar, instead of baseline technologies such as kerosene lanterns, battery lights, candles, or even poor-quality solar products etc.

Introduction to Impact Metrics

Why is there a difference between the cumulative and current energy access figures?

The number of people currently benefiting from off-grid solar lighting products sold by affiliates is almost 40% of those who, cumulatively, have benefitted from improved energy access. The difference between the two estimates arises from the conservative way that GOGLA reports impact data, incorporating a product 'end of life' period into the measurement. This period is calculated as 1.5 times the warranty of a product and is usually between two and five years. After that time has lapsed, no further impact is reported for that product. However, it is likely that a significant number of the products are continuing to benefit households beyond this period, or that these households may have continued to use solar products not reported in this exercise.



Impact Metrics Highlights

Key Impact Estimates

Impact estimates relate to off-grid solar lighting products sold by participating affiliates²⁵ (as of Dec 2019)

313 million

people who have ever lived in a household with improved energy access²⁶ as a direct result of off-grid solar lighting products sold since July 2010



107 million

people currently living in a household with improved energy access

63 million

people currently accessing Tier 1 energy services, based on the Sustainable Energy for All Global Tracking Framework

10.4 million

people currently accessing Tier 2 energy services based on the Sustainable Energy for All Global Tracking Framework

2.7 million

people currently using their SHS to support an enterprise (e.g. charging phones for a fee or operating a bar, restaurant or shop/stall at night)

5.2 million

people currently undertaking more economic activity as a result of using off-grid solar lighting products

2.8 million

people spending more time working as a result of using off-grid solar lighting products



\$5.7 billion

additional income generated as a result of off-grid system ownership, over the expected lifetime of all off-grid solar lighting products sold since July 2010



\$11 billion

savings on energy expenditure, over the expected lifetimes of all portable lanterns or multi-light systems sold since July 2010



74 billion

additional light hours used across all households, over the expected lifetime of all off-grid solar lighting products sold since July 2010



22.8 million

kerosene lanterns no longer in use, replaced with off-grid solar lighting products



74 million

metric tonnes of carbon dioxide and black carbon emissions avoided (in CO₂e), over the expected lifetime of all off-grid solar lighting products sold since July 2010

²⁵ Affiliates include GOGLA members, companies selling products that meet Lighting Global Quality Standards, and appliance companies that participated in the Global LEAP Energy Efficient Appliance Awards or are engaging with the Low Energy Inclusive Appliances (LEIA) programme.

²⁶ In this context, 'improved' is used to reflect lighting and energy provided by appropriate (less expensive, less dangerous, better quality) technologies such as solar, instead of baseline technologies such as kerosene lanterns, battery lights, candles, or even poor-quality solar products etc

Global and Regional Analysis of Estimated Impact

The Regional Impact Framework

The latest version of the impact metrics framework enables impact measurement of different categories of off-grid technology, while accounting for regional variations. This means that, for the first time, we are able to offer tailored impact estimates specifically for certain regions: East Africa, West Africa and South Asia.²⁷

The methodology section at the start of this report outlines which countries are grouped in the subregions East Africa, West Africa and South Asia. 'Other Regions' includes all other countries. 'Unspecified' indicates that reported sales have not been allocated to a certain region.

It should be noted that the revised variables, including the regional split, will only be applied to sales collected from this current reporting round onwards. This allows the impact estimates to best represent the state of the market at the time the sales occurred.

Energy Access

Since the start of our data collection, an estimated 313 million people have experienced improved energy services (see Figure 31). The number of people that are currently benefiting from these improvements has been quite consistent, standing at a little over 100 million for the past few reporting rounds, with the current count at 106 million. This number is expected to keep increasing. However it should be noted that this past round has seen a large number of portable lanterns falling out of warranty. In line with the metric framework's conservative approach, these are no longer calculated within the overall estimate.

This is also reflected in the slight decrease of people estimated to be receiving Tier 1 energy

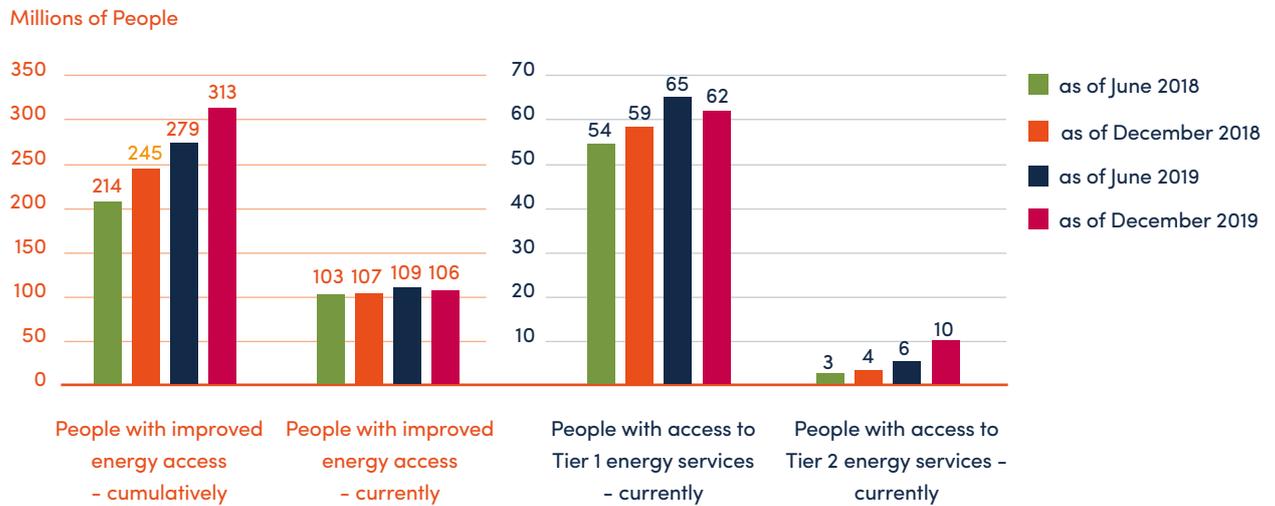
access, as seen in Figure 31. The previous round already showed a strong growth in the number of people with Tier 2 energy access, and this trend continues into the second half of 2019, with another 60% increase, thanks to the growth in sales of 21+ Wp solar home systems. This means that over 10 million people now have enough energy each day to power a range of appliances, including TVs and fans.

Of the 106 million people currently benefiting from energy access, 37% are located in East Africa, followed by 28% in South Asia – reflecting the large share of sales made in these two main markets (Figure 32).

²⁷ GOGLA, Standardised Impact Metrics for the Off-Grid Solar Energy Sector, Version 4.0, 2020. Full report here: www.gogla.org/gogla-impact-metrics.

Global and Regional Analysis of Estimated Impact

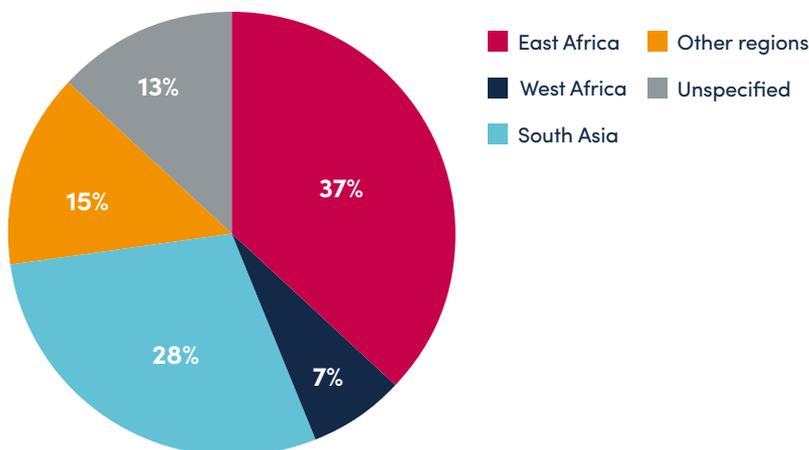
Figure 31 - Semi-Annual Evolution of Energy Access metrics (on the right metrics 1ai and 1aii, on the left 1bi and 1bii)



NOTE:

The Tiers of Energy Access are computed based on the Sustainable Energy for All (SEforAll) Global Tracking Framework. Tier 1 refers to the most basic energy access of lighting and phone charging, while Tier 2 includes small energy-efficient household appliances such as TVs.

Figure 32 - People with Improved Energy Access Currently (metric 1aii), split regionally



NOTE:

'Other Regions' include the remaining sub-regions of Sub-Saharan Africa, East Asia and Pacific, Middle East and North Africa and Latin America and the Caribbean. While 'Unspecified' indicates that reported sales have not been allocated to a certain region.

Global and Regional Analysis of Estimated Impact

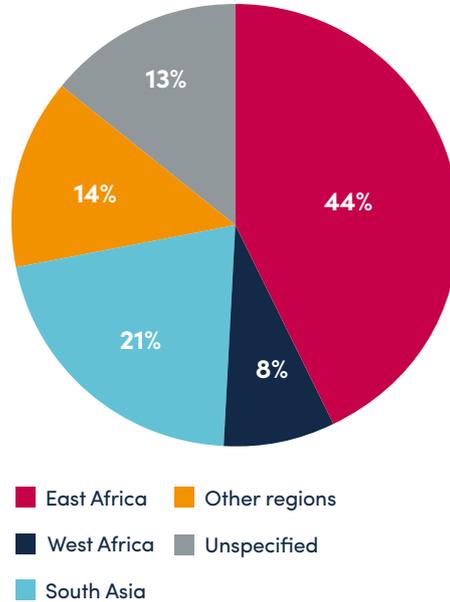
Economic Activity

While large solar home systems unlock greater amounts of economic activity as a percentage of sales, due to the higher absolute number of portable lantern and multi-light kit sales, the largest numbers of people reporting increases in economic activity are seen in the smallest system size ranges (Figure 33).

Of the more than five million people currently undertaking more economic activity, 44% are located in East Africa, while 8% and 21% are located in West Africa and South Asia, respectively (Figure 34). In South Asia, high volumes of sales overall contribute to the significant impact seen, while in East Africa, this is driven by both high sales volumes and a higher proportion of customers undertaking economic activity.

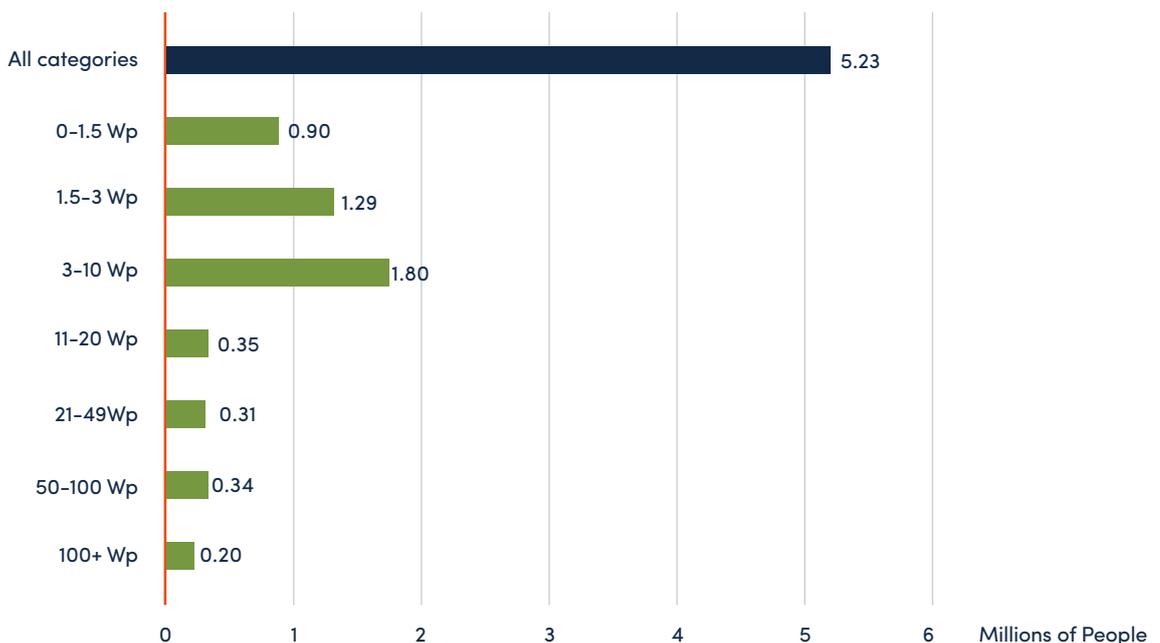
The cumulative amount of additionally generated income arising from increased economic activity, is estimated at \$5.7 billion. In addition, households that have purchased smaller products (<11 Wp) often benefit from the financial savings when they no longer need to buy kerosene, candles or torches, or, in many cases, no longer pay a fee to charge their phones. Since the start of the data collection in 2010, this amount has accumulated to \$11 billion (see Table 8).

Figure 34 - People Undertaking More Economic Activity (metric 2a) split regionally



NOTE:
 'Other Regions' include the remaining sub-regions of Sub-Saharan Africa, East Asia and Pacific, Middle East and North Africa and Latin America and the Caribbean. While 'Unspecified' indicates that reported sales have not been allocated to a certain region.

Figure 33 - People Undertaking More Economic Activity (metric 2a) global, split per product category



NOTE:
 Lanterns 0-1.5 Wp include one light and no mobile charging, lanterns 1.5-3 Wp one light and mobile charging, and multi-light systems 3-10 Wp at least two lights and mobile charging. Solar home systems >11 Wp are classified based on panel wattage.

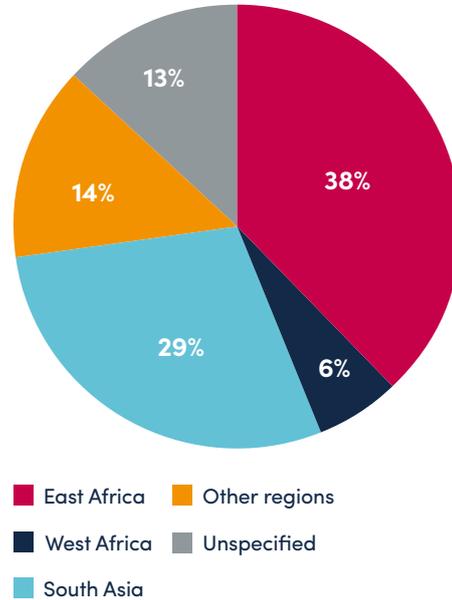
Global and Regional Analysis of Estimated Impact

Environment

Due to the magnitude of sales, small lanterns have also created the greatest estimated impact when looking at the CO₂e reductions resulting from eliminating kerosene usage (Figure 35). The majority of the 22.8 million kerosene lanterns replaced by a solar product are in East Africa (38%) and South Asia (29%). West Africa accounts for only 6% (Figure 36). In addition to market size, this can be attributed to the fact that customers in West Africa often replace the use of torches, candles or diesel generators with their solar product, rather than kerosene lanterns.²⁸

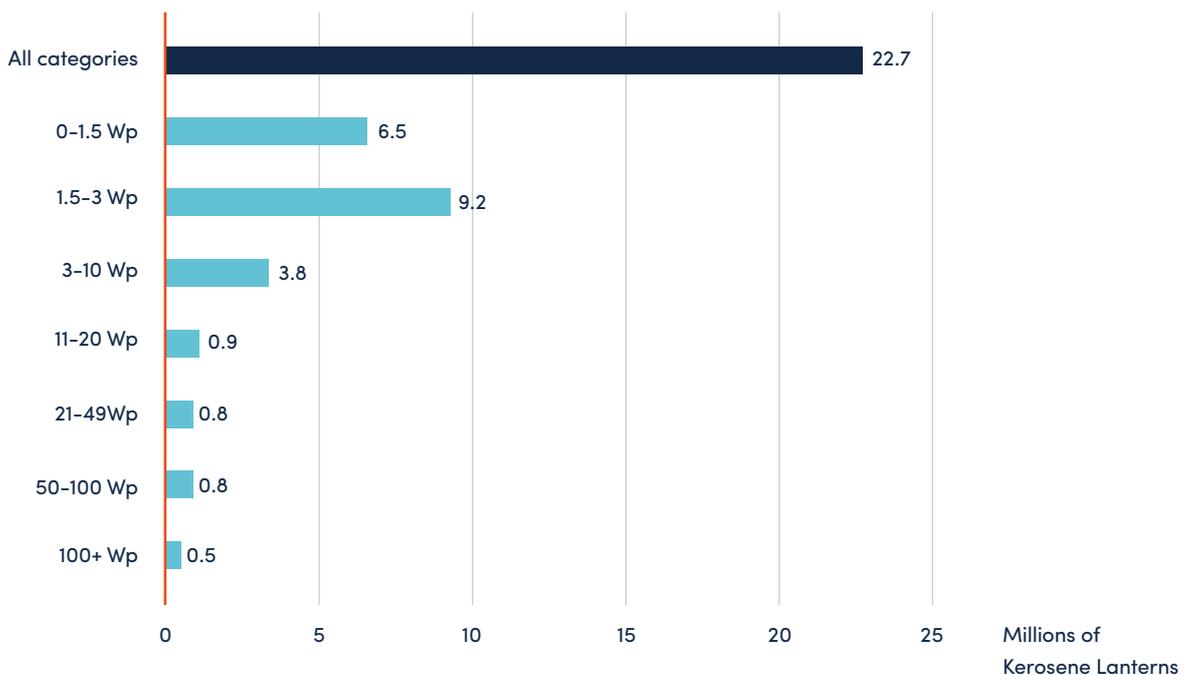
To date, the amount of carbon dioxide and black carbon emissions avoided (measured in CO₂e), since data collection began in 2019 stands at 74 million metric tons. This is equivalent to 19 coal fired power plants being taken offline for one full year.²⁹

Figure 36 – Kerosene Lanterns Replaced (metric 4) split regionally



NOTE:
 'Other Regions' include the remaining sub-regions of Sub-Saharan Africa, East Asia and Pacific, Middle East and North Africa and Latin America and the Caribbean. While 'Unspecified' indicates that reported sales have not been allocated to a certain region.

Figure 35 – Kerosene Lanterns Replaced (metric 4) global, split per product category



NOTE:
 Lanterns 0-1.5 Wp include one light and no mobile charging, lanterns 1.5-3 Wp one light and mobile charging, and multi-light systems 3-10 Wp at least two lights and mobile charging. Solar home systems >11 Wp are classified based on panel wattage.

²⁸ GOGLA, 'Powering Opportunity in West Africa', 2020. Full report here: https://www.gogla.org/sites/default/files/resource_docs/powering_opportunity_west_africa_eng_0.pdf

²⁹ United States Environmental Protection Agency, 'Greenhouse Gas Equivalencies Calculator' Full information here: <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>

Global and Regional Analysis of Estimated Impact



Global and Regional Analysis of Estimated Impact

Light Quality

Finally, the increase in larger system sales means that, on average, people are benefiting from more additional hours of light and that light quality is getting brighter. The upwards trend of the previous reporting round persists, with households now having an average of 1,316 extra hours of light per year providing an additional 157 lumens (see figures 37 and 38).

Figure 37 - Semi-annual Evolution of Change in quality of light - household (metrics 5b)

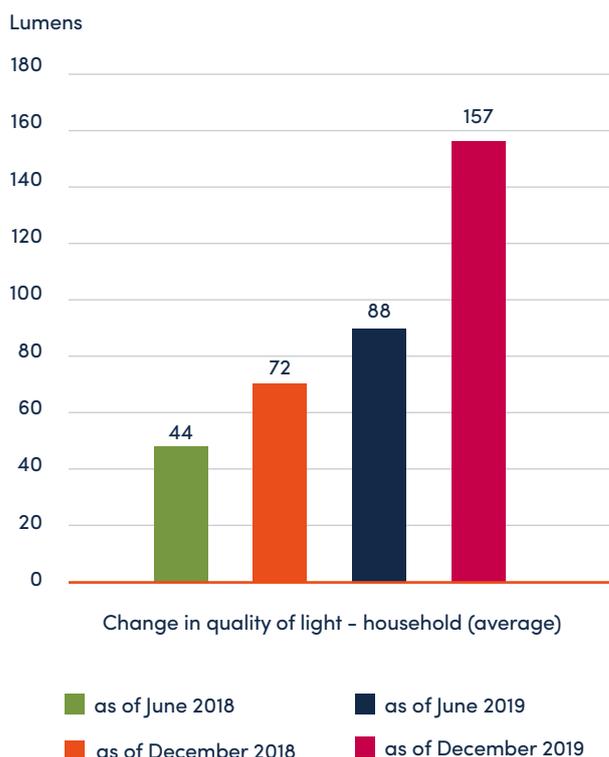


Figure 38 - Semi-annual Evolution of Additional Light Hours Used - household (metrics 5a ii)

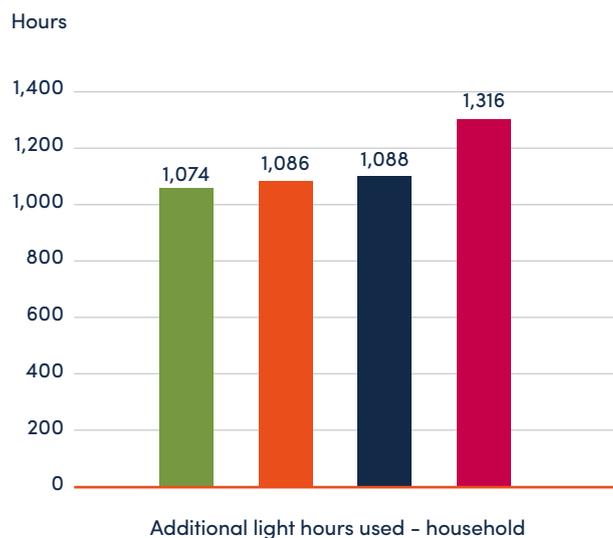


Table 8 – Global Impact by Product Category (continues on next page)

Product Categories	Number of People with Improved Energy Access - Cumulatively	Number of People with Improved Energy Access - Currently	Number of People with Access to Tier 1 Energy Services - Currently	Number of People with Access to Tier 2 Energy Services - Currently
All Categories	313 million	106.6 million	62.6 million	10.4 million
0-1.5 Wp	138.4 million	29.7 million	7.2 million	-
1.5-3 Wp	121.1 million	42.4 million	32.8 million	-
3-10 Wp	35.1 million	18.0 million	17.2 million	-
11-20 Wp	5.9 million	4.7 million	4.2 million	0.2 million
21-49 Wp	4.4 million	4.1 million	0.9 million	3.1 million
50-100 Wp	4.8 million	4.6 million	0.0004 million	4.4 million
100+ Wp	3 million	2.8 million	-	2.6 million

Global and Regional Analysis of Estimated Impact

Table 8 – Global Impact by Product Category

Product Categories	Number of People Undertaking More Income Generating Activities - Currently	Number of People Using Products to Support Enterprise - Currently	Number of People that Spend More Time Working - Currently	Additional Income Generated- Cumulatively
All Categories	5.2 million	2.7 million	2.9 million	US\$ 5.7 billion
0-1.5 Wp	0.9 million	0.6 million	0.3 million	US\$ 1.4 billion
1.5-3 Wp	1.2 million	0.9 million	0.4 million	US\$ 1.2 billion
3-10 Wp	1.8 million	0.6 million	1.3 million	US\$ 1.8 billion
11-20 Wp	0.3 million	0.1 million	0.2 million	US\$ 0.3 billion
21-49 Wp	0.3 million	0.1 million	0.2 million	US\$ 0.2 billion
50-100 Wp	0.3 million	0.1 million	0.2 million	US\$ 0.3 billion
100+ Wp	0.2 million	0.08 million	0.1 million	US\$ 0.2 billion

Product Categories	Additional Light Hours Used - Cumulatively	Additional Light Hours Used - Household	Change in Quality of Light - Household
All Categories	74 billion	1,316	157
0-1.5 Wp	31.7 billion	1,194	-13
1.5-3 Wp	27.2 billion	1,194	35
3-10 Wp	7.9 billion	1,226	133
11-20 Wp	1.6 billion	1,378	270
21-49 Wp	1.3 billion	1,458	861
50-100 Wp	2.5 billion	2,549	535
100+ Wp	1.6 billion	2,609	2,046

Product Categories	Savings on Energy Expenditures - Cumulatively	Savings on Energy Expenditures - Household	Kerosene Lanterns Replaced - Currently	CO2e Emissions Avoided - Cumulatively
All Categories	US\$ 11 billion	US\$ 187	22.7 million	74.3 million
0-1.5 Wp	US\$ 5.8 billion	US\$ 193	6.4 million	32.3 million
1.5-3 Wp	US\$ 4.2 billion	US\$ 181	9.2 million	27.2 million
3-10 Wp	US\$ 0.9 billion	US\$ 192	3.7 million	8.1 million
11-20 Wp			0.9 million	1.6 million
21-49 Wp			0.8 million	1.3 million
50-100 Wp			0.8 million	2.3 million
100+ Wp			0.5 million	1.3 million

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