

World Bank Electrification Data

ESCWA Workshop

June 15, 2021





Session 1: World Bank Electrification Database



Definition and Concept



■ Definition

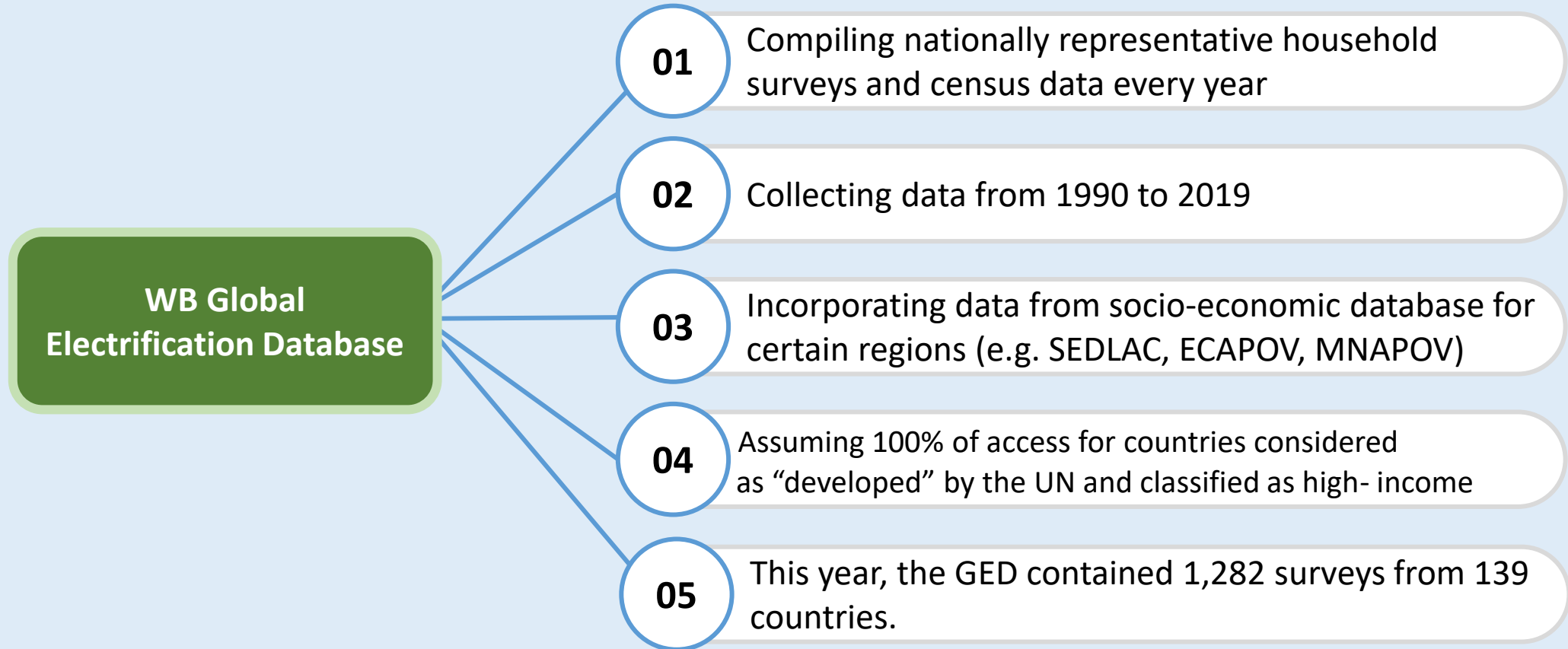
Target	Indicator
7.1 By 2030, ensure universal access to affordable, reliable, and modern energy services	7.1.1 Proportion of population with access to electricity

■ Concept

- **The World Bank is the custodian agency** on access to electricity (SDG7.1.1).
- Access to electricity for this indicator refers to the proportion (share) of population in the considered area (country, region or global context) that has access to a source of electricity (total, urban and rural)
- The electricity access chapter provides global historical trends on access to electricity (1990-2019) and tracks the electrification pace of countries from the household perspective
- Tracking SDG7 is a comprehensive tool to track the energy pillars (access to electricity and clean cooking, renewables and efficiency) in 220 countries
- Tracking SDG7 2021 was launched in **June 2021 / will be a key document for the High-level Dialogue on Energy in September 2021**
- **Data available on <https://trackingsdg7.esmap.org/>**



Methodology





Methodology: Data Collection & Validation Processes

Step 1

Data collection

Collect data from household surveys and censuses, tapping into a wide number of different survey types covering 220 countries from 1990 to 2019 (the latest year – two-year lag).

Step 2

Estimate for missing values

Since survey results are not available due to infrequent publication, a **multilevel nonparametric modeling approach** was adapted to predict the missing data points between 1990 and 2019.

Step 3

Data Validation: Consultation with WB energy country teams

After completing data compilation, the SDG7.1.1 team conducts rounds of consultations to validate data.

Step 4

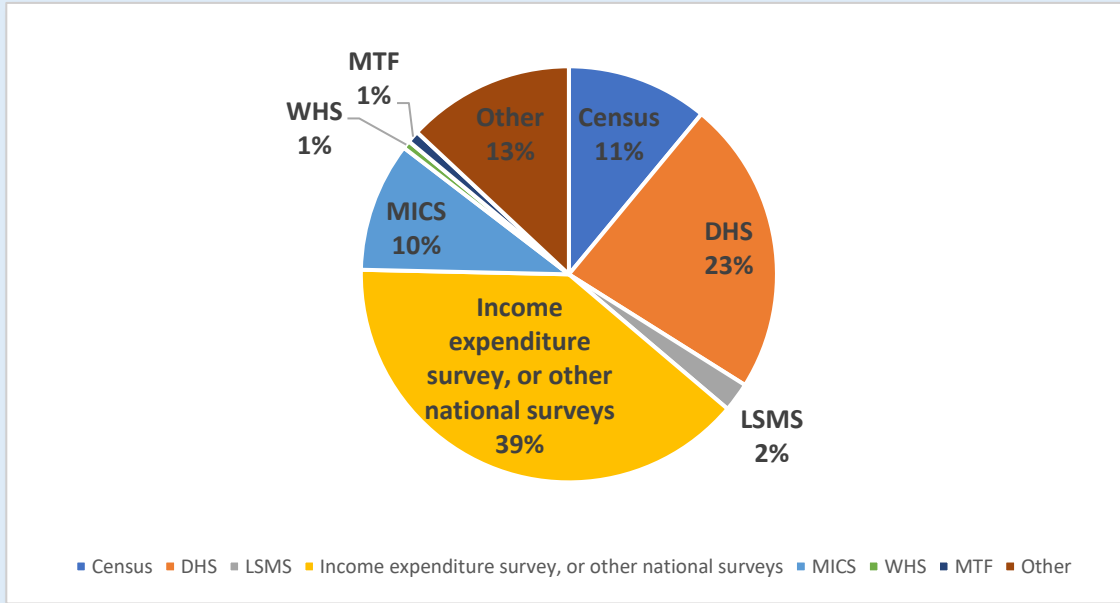
Data validation: Coordination with the UN regional commissions

After internal consultations, the SDG7.1.1 team coordinates with the UN regional commissions to validate data



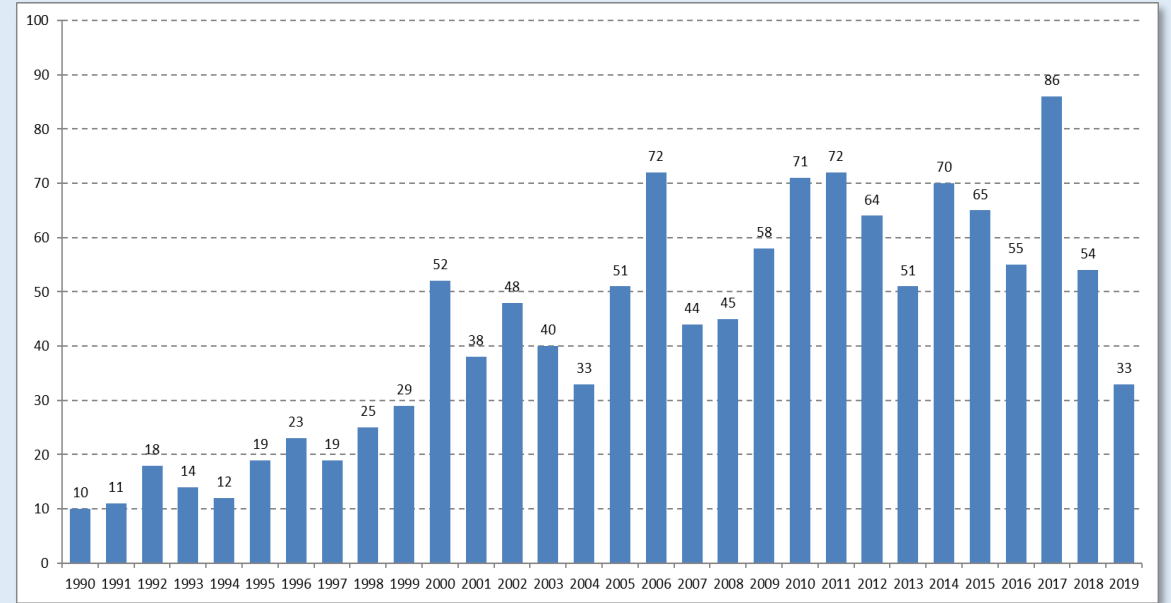
Methodology: Overview of Data Sources

Types of data sources from 1990 to 2019



Source: World Bank 2021.

Number of surveys collected from 1990 to 2019



Source: World Bank 2021.



Methodology: Overview of Data Sources

Name	Statistical Agency	Number of countries	Number of surveys	Questions on electrification standardized across countries
Census	National statistical agencies	76	141 (11%)	Is the household connected to an electricity supply? Does household have electricity?
Demographic and Health Survey (DHS)	Funded by the USAID; Implemented by ICF International	91	294 (23%)	Does your household have electricity?
Living Standards Measurement Survey (LSMS)	National statistical agencies supported by the World Bank	22	29 (2%)	Does your household have electricity? What is your main source of energy for lighting?
Income expenditure survey or other national surveys	National statistical agencies supported by the World Bank	115	502 (39%)	Is the house connected to an electricity supply? What is your primary source of lighting?
Multi Indicator Cluster Survey (MICS)	United Nations Children's Fund (UNICEF)	68	129 (10%)	Does your household have electricity?
World Health Survey	World Health Organization (WHO)	8	8 (1%)	
Multi-Tier Framework (MTF)	World Bank and national statistical offices	12	12 (1%)	
Other		73	167 (13%)	



Methodology: Estimating Missing Values

Multi-level nonparametric model

Purpose

Obtaining a complete set of annual trends of electricity access rates between 1990-2019

Design

It is designed to estimate access rates for countries without survey data in a particular year. The model follows empirical data without being influenced by large fluctuations in survey estimates.

Regional Trends

Multilevel modeling considers the hierarchical structure of the data correlated within countries, which are then clustered within regional groups. Estimated value is affected by regional trends.

Assumption

Countries considered “developed” by the UN and classified as high-income are assumed to account for 100% of access rate from the first year the country joined the category.

Computation

To avoid having electrification trends from 1990 to 2010 overshadow electrification efforts since 2010, the model was run twice:

- With survey data + assumption from 1990-2010 for model estimates from 1990-2010
- With survey data + assumption from 2010-2019 for model estimates from 2010-2019

The difference between real data points and estimated values is clearly identified in the database.



Methodology: Calculation of Rural Data

Back-calculation method

Because of rural population data's poor quality, the World Bank back-calculates rural data in order to make sure the urban and rural population access data adds up to total access population data.

Total population with access is calculated by the following formula:

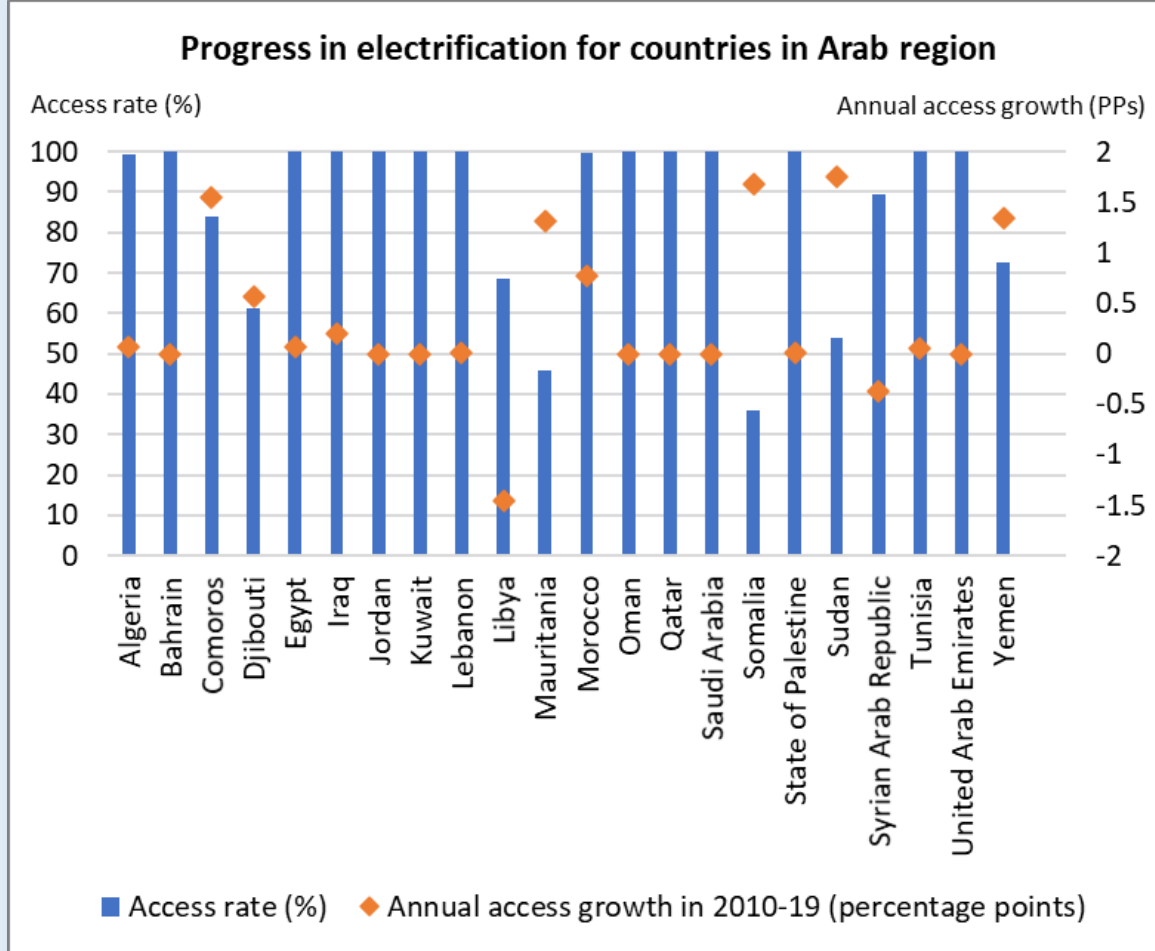
$$(Total\ rate * Total\ population) = (Urban\ rate * Urban\ population) - (Rural\ rate * Rural\ population)$$

Given the above formula, rural rate is found by back-calculation:

$$Rural\ rate = \frac{(Total\ rate * Total\ population) - (Urban\ rate * Urban\ population)}{Rural\ population}$$



Electrification data in Arab region



Source: World Bank 2021.

- ❑ The access rate in Arab region has increased from 86% in 2010 to 90% in 2019 – leaving 45 million people lacking access.
- ❑ Since 2010, 78 million people gained access.
- ❑ 14 countries in Arab region reached universal access as of 2019.
- ❑ Electrification in 10 countries outpaced population growth for 2010-19.
 - Algeria, Comoros, Egypt, Iraq, Lebanon, Morocco, Palestine, Sudan, Tunisia, Yemen
- ❑ Somalia and Mauritania presented lower access rates in 2019. But the progress in electrification has been steadily made over the past years.
- ❑ Libya has shown a decreasing trend in electrification.
- ❑ Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and UAE are categorized as high-income countries.



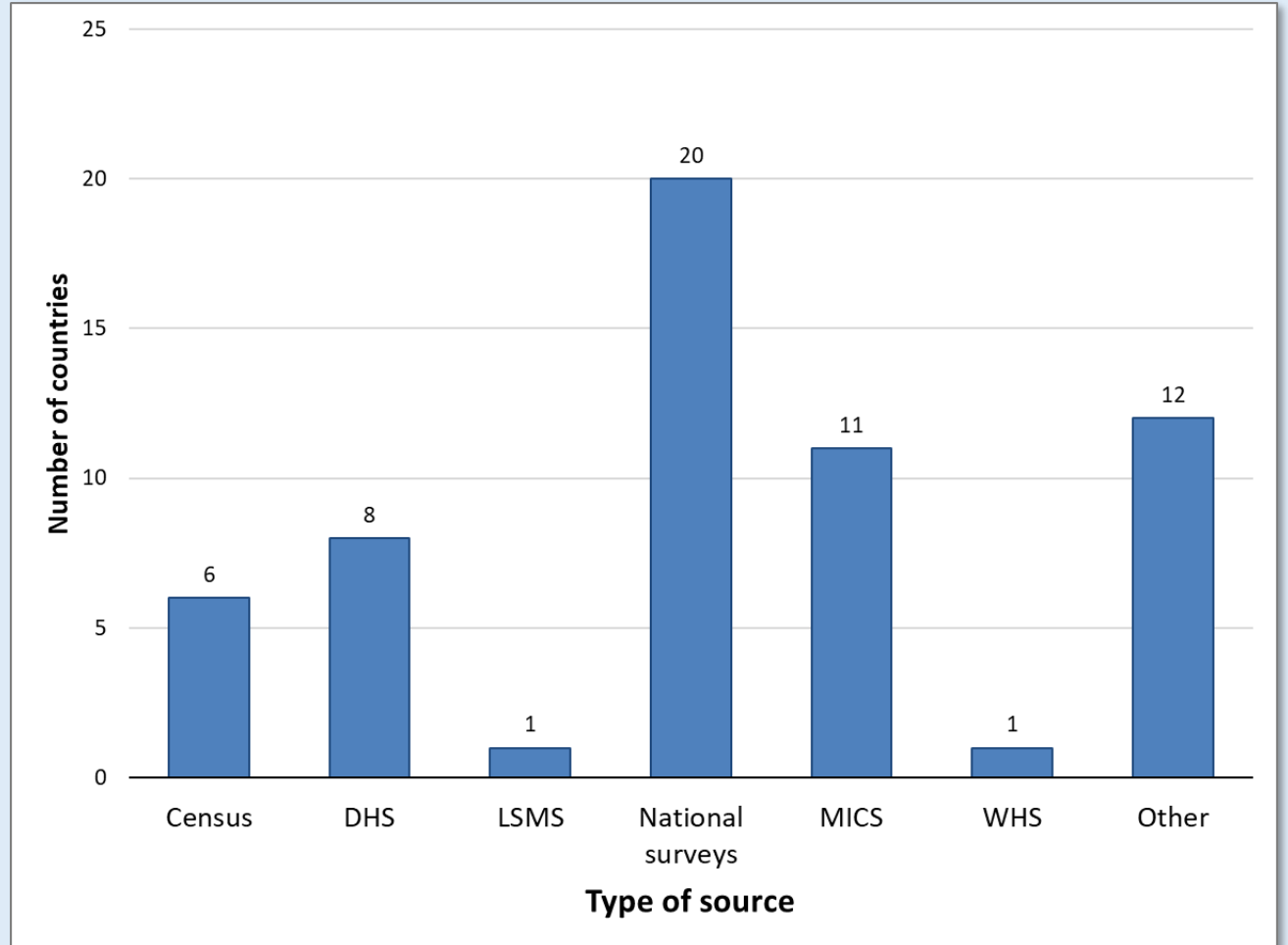
Electrification data in Arab region

Number of survey data in Arab region



Source: World Bank 2021.

Number of countries in Arab region covered by source



Source: World Bank 2021.



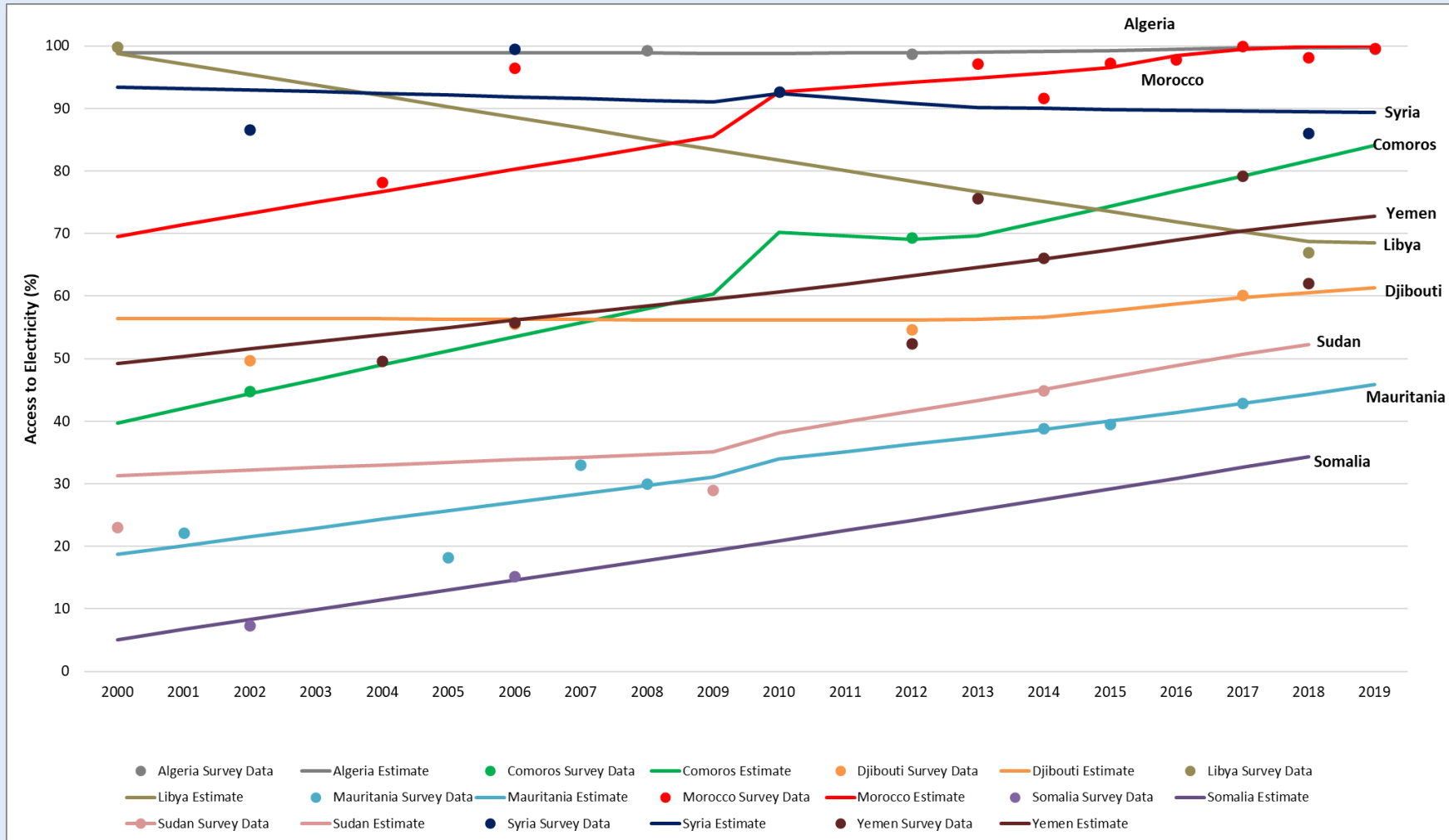
Income classification 2019 for countries in Arab region

Country	Income group	First year to join the group	Assumption
Algeria	Lower middle income		
Bahrain	High income	Joined since 2011	100
Comoros	Lower middle income		
Djibouti	Lower middle income		
Egypt, Arab Rep.	Lower middle income		
Iraq	Upper middle income		
Jordan	Upper middle income		
Kuwait	High income	Joined since 1990	100
Lebanon	Upper middle income		
Libya	Upper middle income		
Mauritania	Lower middle income		
Morocco	Lower middle income		
Oman	High income	Joined since 2007	100
Qatar	High income	Joined since 1990	100
Saudi Arabia	High income	Joined since 2004	100
Somalia	Low income		
Sudan	Low income		
Syrian Arab Republic	Low income		
Tunisia	Lower middle income		
United Arab Emirates	High income	Joined since 1990	100
State of Palestine	Lower middle income		
Yemen, Rep.	Low income		

Source: World Bank 2021.



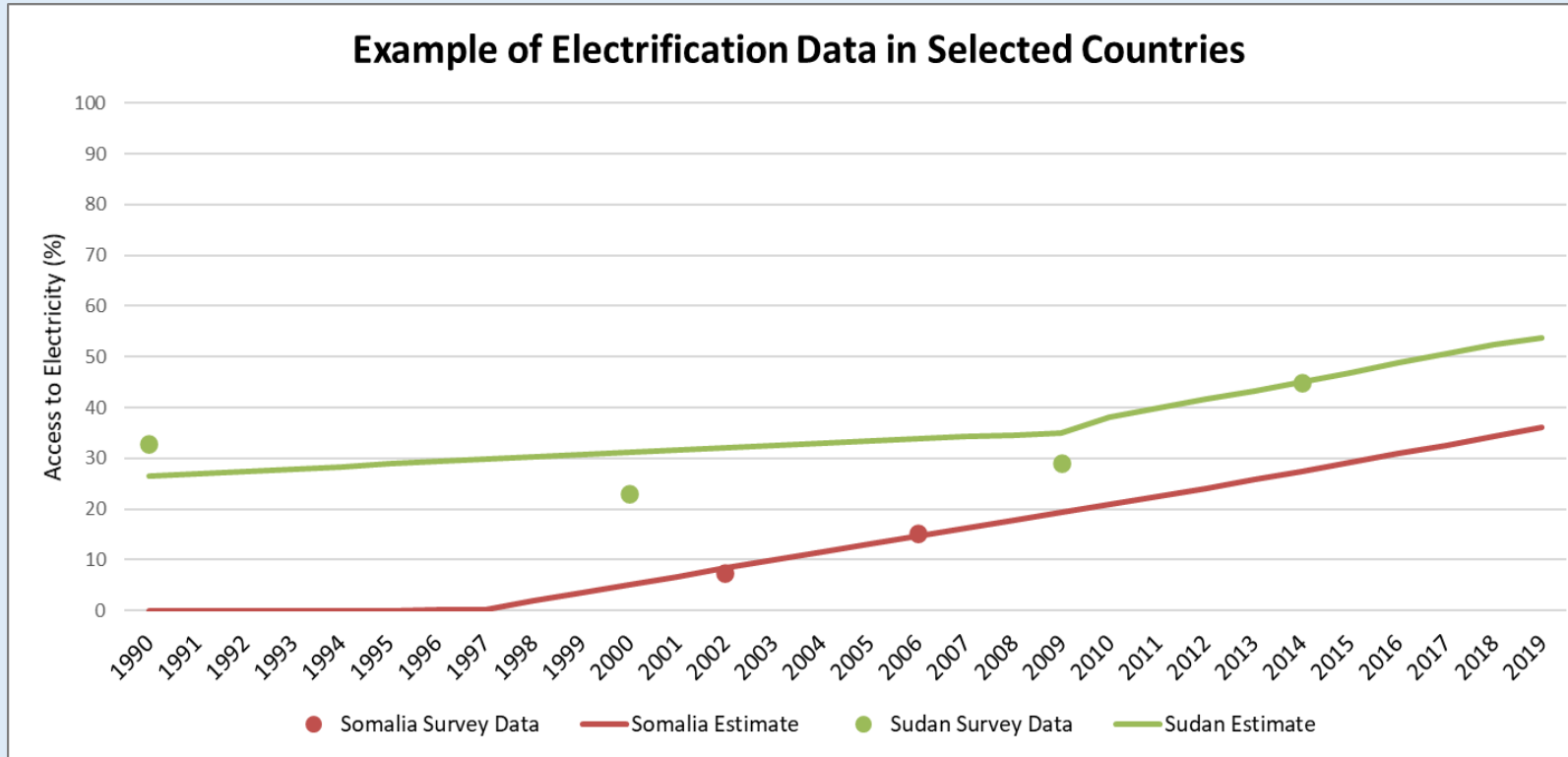
Survey data and model estimates for access-deficit countries in Arab region



Source: World Bank 2021.



Country Examples: Somalia and Sudan



Source: World Bank 2021.

- Sudan had 4 surveys in 1990-2019 comprising Demographic and Health Survey (DHS), Multi-Indicator Cluster survey (MICS), and a national survey, while the remaining years are filled with estimates.
- Since 2000, Somalia had received 2 surveys from a national survey and MICS in the same period.
- When new data points are released, all estimated values from the model will change slightly.



Challenges in Methodology

- ❑ The World Bank **estimates demand-side access rates** to better understand the access levels experienced by the population. Thus, the presence of an electricity connection in household does not necessarily guarantee that energy supplied is adequate in quality, reliability, or affordability in cost.
 - The Multi-Tier Framework (MTF) was introduced to capture these broader dimensions of service quality.
- ❑ **Since surveys can be irregularly/infrequently published** in many regions, it could be hard to understand the ground level trends for short-term periods.
- ❑ Due to **low quality of population data in rural areas**, the rural access rate could be skewed.

Q & A Session





Session 2: Integration of the MTF Module into National Household Survey



Measuring Energy Access

- ❑ WHO and the World Bank ESMAP and LSMS teams joined effort to develop a practical guidebook on Measuring Energy Access

- ❑ The two core objectives of the guidebook are
 - To provide survey practitioners with the requisite tools and technical support to successfully integrate the new energy access questions into existing national household surveys.
 - To provide support on the computation of data collected to track the progress toward SDG 7.1, towards informing more effective policies and programs.



Measuring Energy Access

- ❑ It builds on ongoing collaboration between the WB LSMS and ESMAP teams to develop and test of energy questionnaires
 - Survey module has been tested in 16 countries as of now.
- ❑ Scale up effort: As part of the WB TA effort to NSOs, the Core Questions on Household Energy Use have been incorporated into existing national surveys



Clear need to improve assessments of energy access

Binary question doesn't capture multi-dimensionality of energy access issue (SDG 7.1.1 and SDG 7.1.2)

QUESTION	%
Does your household have electricity?	62.8%
What is the main source of energy used for lighting the dwelling?	35.9%
How much did you last pay for electricity?	14.1%
On average, how much does the household spend on electricity each month?	10.3%
How much did this household spend in the last month for each type of fuel used?	7.7%
What is the source of your electricity supply?	6.4%
Is the household connected to the national grid or to a local mini grid?	5.1%
Do you have a generator you use in this house?	5.1%
What is the main reason for your household not to have access to electricity?	3.9%

Source: Authors' compilation from reviewed surveys.

Source: World Bank

QUESTION	%
What type of fuel does your household mainly use for cooking?	86.1%
Is the cooking usually done in the house, in a separate building, or outdoors?	50.6%
Do you have a separate room which is used as a kitchen?	48.1%
How much do you normally spend on the fuel you use for cooking in a month?	25.3%
How much do you spend on the fuel for this stove in the last month/in the last week?	15.2%
Does the fire/stove have a chimney or a hood?	12.7%
In this household, is food cooked on an open fire, an open stove or a closed stove?	11.4%
Does your household currently own an electric or gas stove, wood stove, cooker oven?	11.4%
Do you also sleep in the room where you cook?	3.8%
What other source of heating does your household mainly use?	3.8%

Source: Authors' compilation from reviewed surveys.



Core questions on household energy use

CATEGORY	ESSENTIAL QUESTIONS	RECOMMENDED QUESTIONS
Household electricity	<ul style="list-style-type: none"> main source of electricity appliances powered by main source hours of electricity available each day from main source hours of electricity available each evening from main source frequency and duration of unscheduled blackouts of main source 	<ul style="list-style-type: none"> lightbulbs that can be powered with solar devices (if applicable) electricity provider additional sources of electricity beyond main source damage to devices due to voltage fluctuation injuries from electricity use
Household cooking	<ul style="list-style-type: none"> main and supplementary cookstoves used the brand of the main stove (for solid fuel devices to assess whether the device meets the WHO Guidelines emission rate targets) the fuel used by the device 	<ul style="list-style-type: none"> supplemental stoves and fuels used monthly payments for fuel availability of fuel time spent cooking cooking location ventilation injuries that occurred while cooking
Household heating	<ul style="list-style-type: none"> number of months that the main heating device was used for heating main fuel used for heating the home brand of heating device (for solid fuel devices to assess whether it meets the WHO Guidelines emission rate targets), as well as the main fuel used 	<ul style="list-style-type: none"> ventilation supplementary devices and fuels used injuries that occurred from use of the heating device
Household lighting	<ul style="list-style-type: none"> main lighting source 	<ul style="list-style-type: none"> supplementary lighting sources injuries that occurred from use of the lighting sources
Household energy and gender		<ul style="list-style-type: none"> identify the primary collector of fuel identify the primary cook time spent collecting fuel injuries sustained while collecting or transporting fuel time spent preparing the stove and fuel time spent cooking

Source: World Bank

- WB and WHO co-led the development of the Core Questions on Household Energy Use.
- A short module has been tested in more than 16 countries as of today.



SDG 7.1.1 Indicator

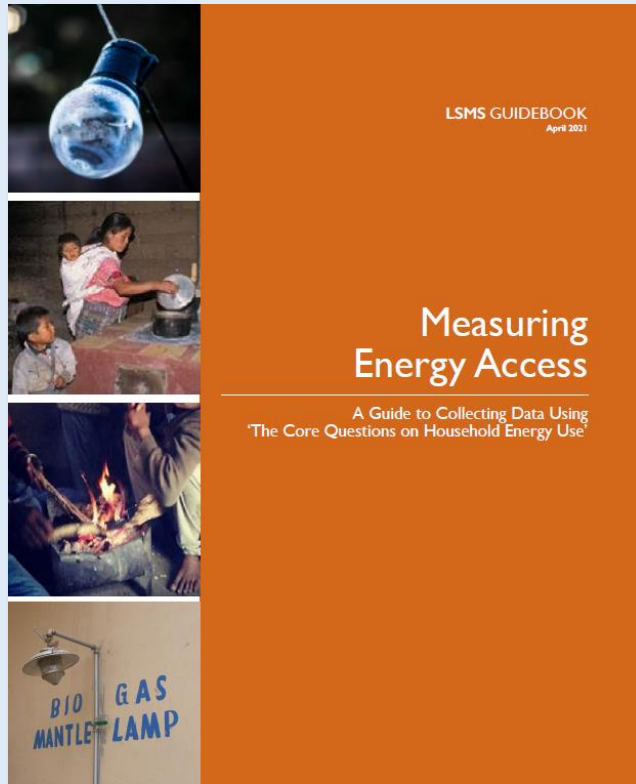
SDG 7.1.1 Indicator: Proportion of population with access to electricity

	ESSENTIAL SURVEY QUESTIONS	INDICATORS
SDG 7.1.1		Percentage of population with access to electricity (Population with access to Tier 1 or above for all seven following sub-indicators).
Capacity	HE3. What source of electricity is used most of the time in this household? HE4. What appliances are powered using this household's solar device/system? HE5. How many lightbulbs can be powered using this household's solar device/system?	Capacity of electricity
Availability	HE7. In the last 7 days, how many hours of electricity were available each day on average from [NAME MAIN electricity system]? (Maximum 24 hours) HE8. In the last 7 days, how many hours of electricity were available each evening on average, from 6:00 pm to 10:00 pm from [NAME MAIN electricity system]? (Maximum 4 hours)	Availability of electricity supply
Reliability	HE9. In the last 7 days, how many times were there unscheduled outages or blackouts from [NAME MAIN electricity system]? HE10. What is the total duration of all the unscheduled outages or blackouts in the last 7 days?	Reliability of electricity supply
Quality	HE12. In the last 12 months, did any of this household's appliances get damaged because the voltage was going up and down in the [NAME MAIN electricity system from HE3]?	Voltage fluctuation of electricity supply
Affordability	This information is collected in the expenditure/consumption module	Affordability of electricity service
Formality	HE6. Who does this household currently pay for [NAME MAIN electricity system]?	Formality of electricity
Safety	HE13. In the last 12 months, did anyone using [NAME MAIN electricity system from HE3] die or have permanent limb (bodily injury) damage?	Safety of electricity

Source: World Bank



What's next?



Publishing the guidebook for the survey practitioners



Online course for energy survey design, implementation and data analysis

Q & A Session



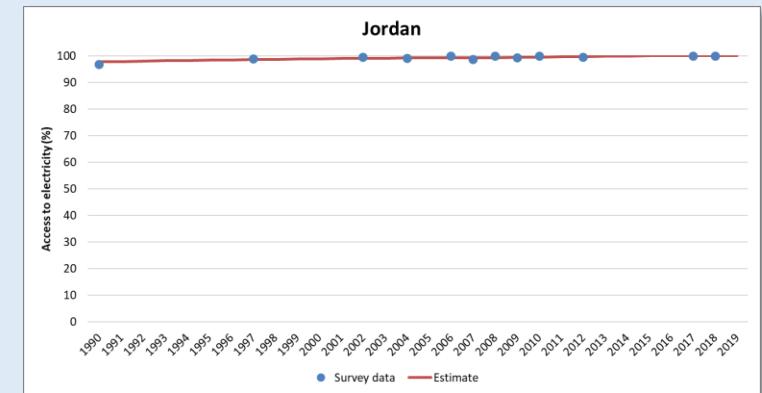
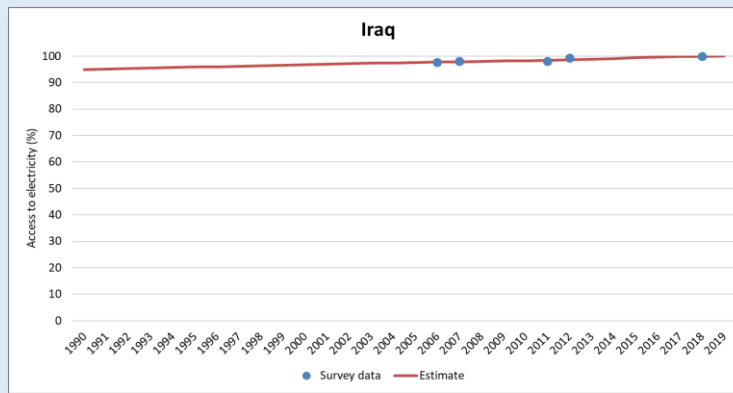
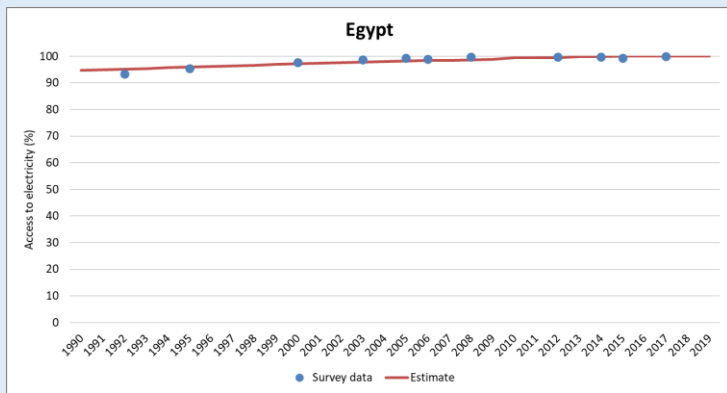
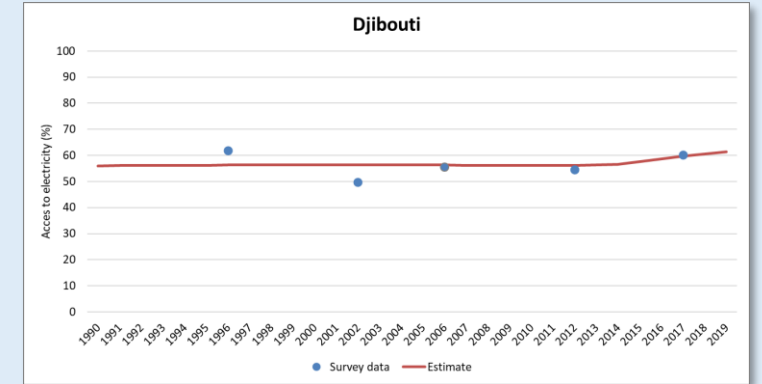
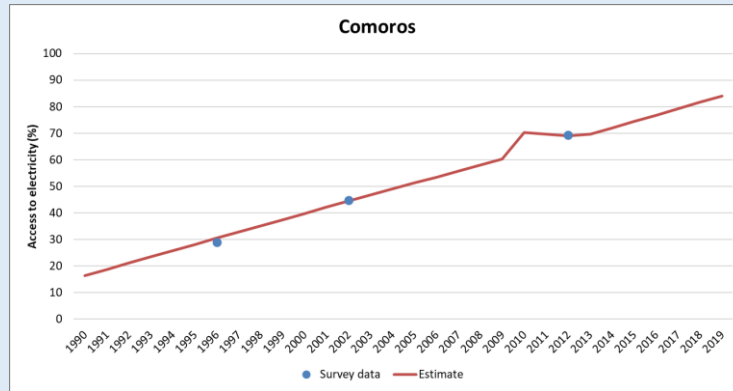
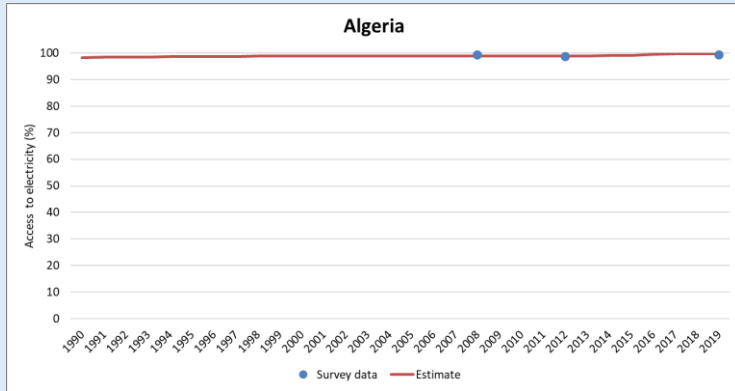
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Annexes



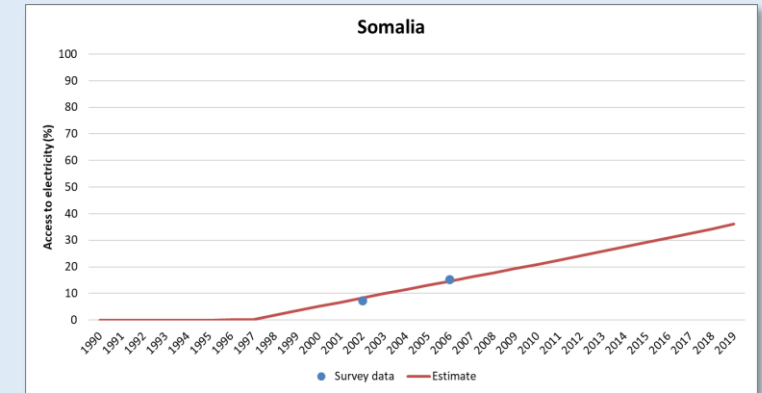
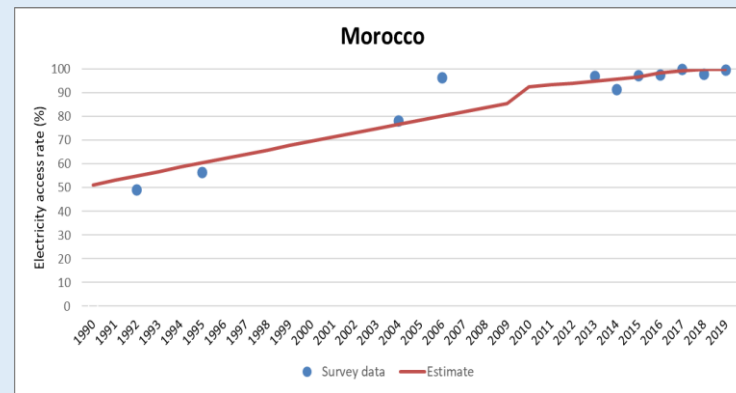
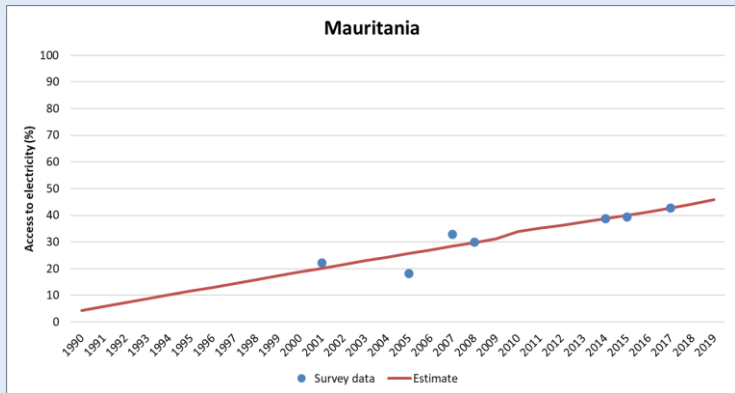
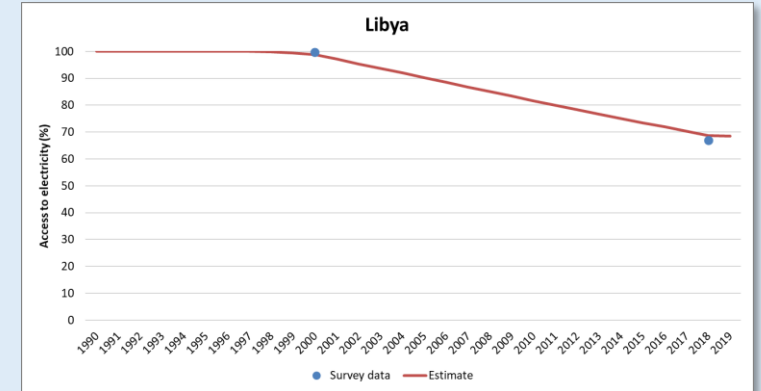
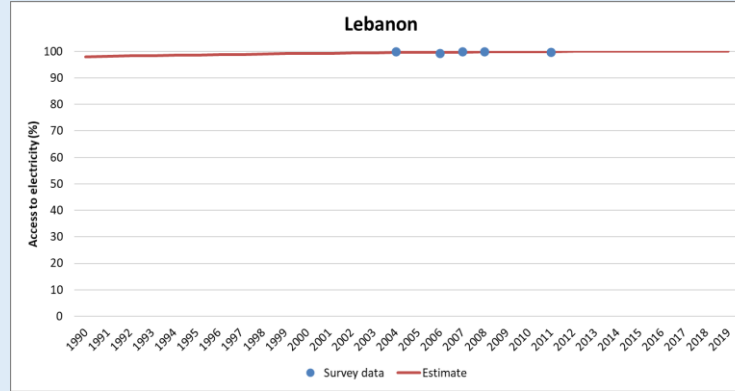
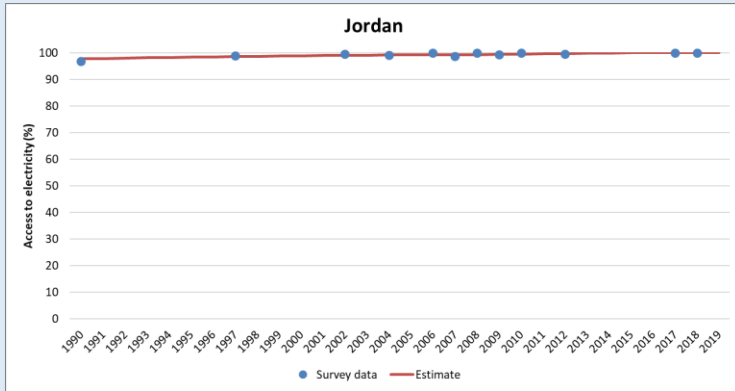
Country trajectories: Survey data and model output, 1990-2019



Source: World Bank



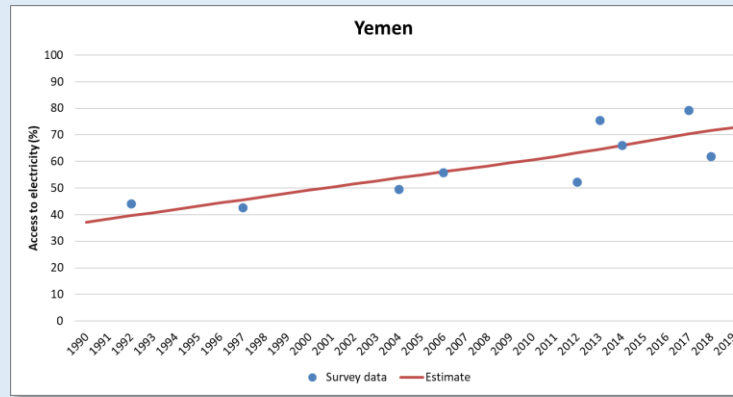
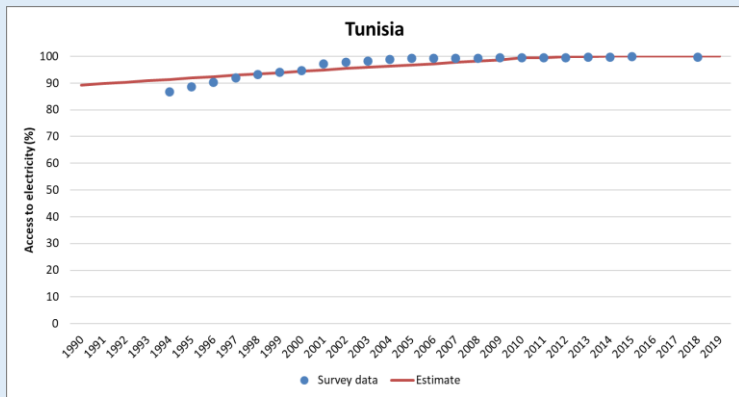
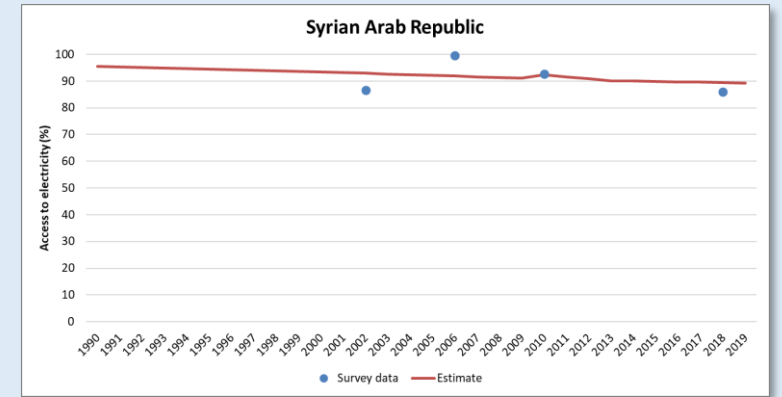
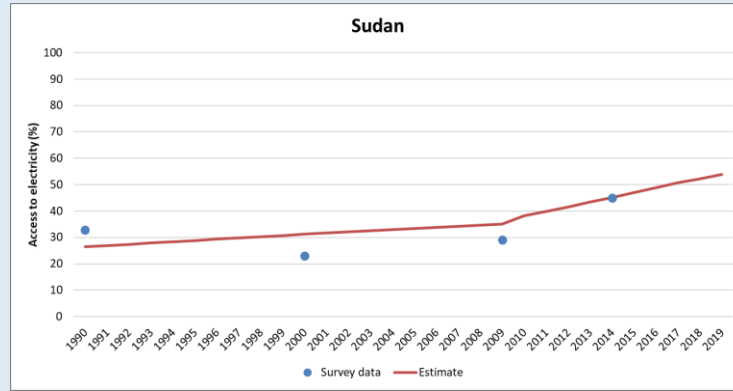
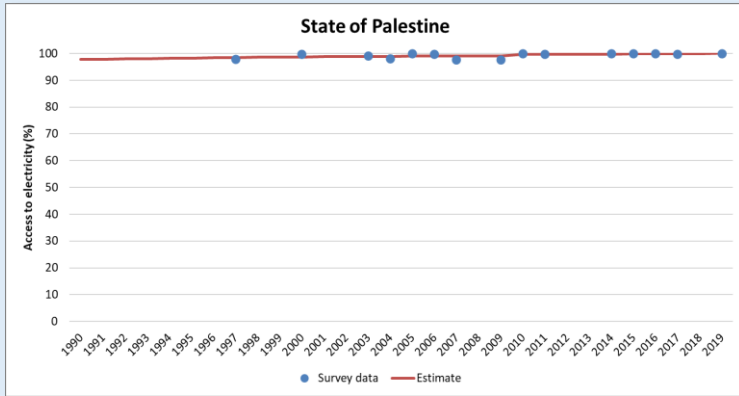
Country trajectories: Survey data and model output, 1990-2019



Source: World Bank



Country trajectories: Survey data and model output, 1990-2019



Source: World Bank