

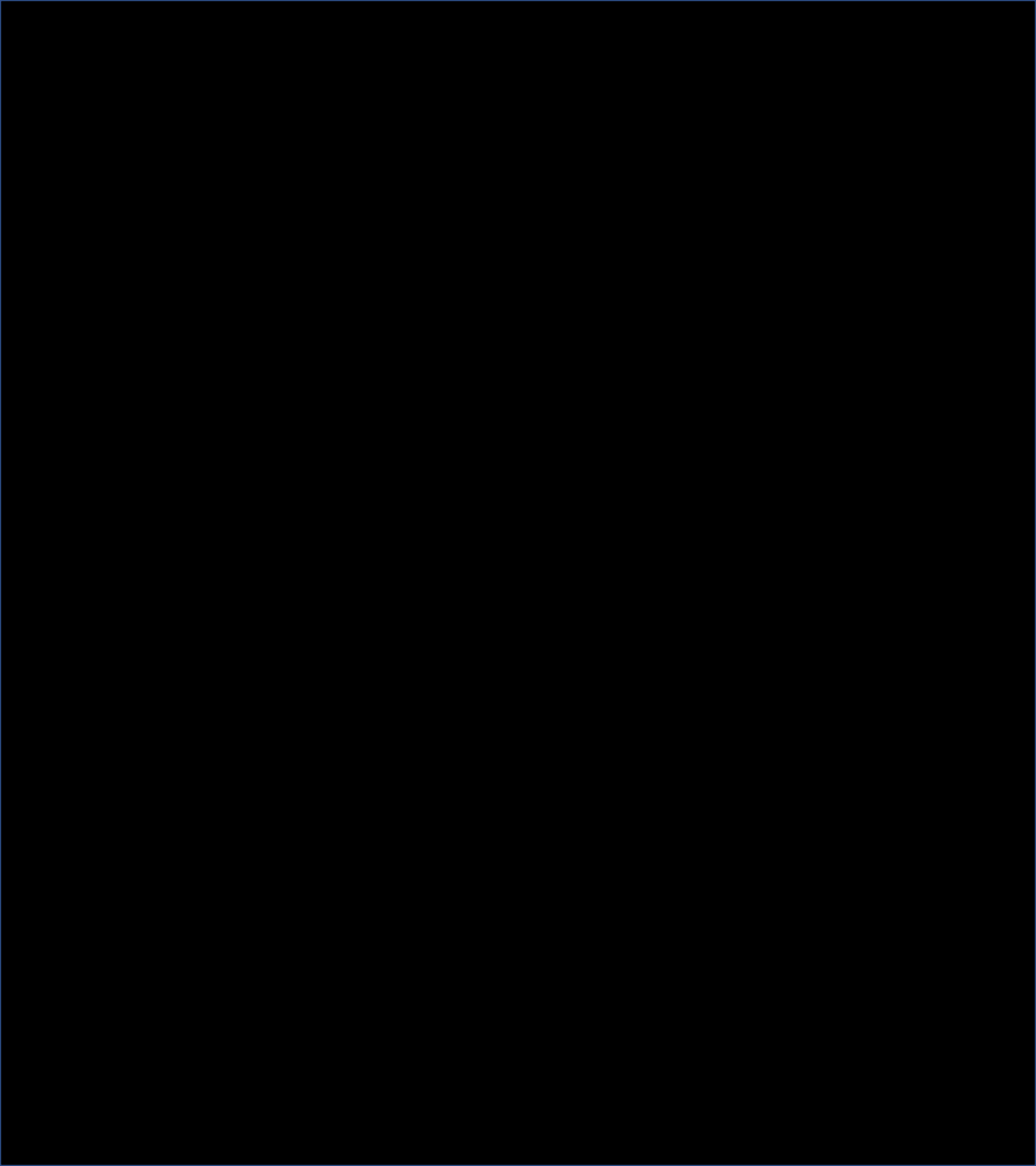


ORES Virtual Conference 2021

Decentralized MTF Data Collection at The Household Level

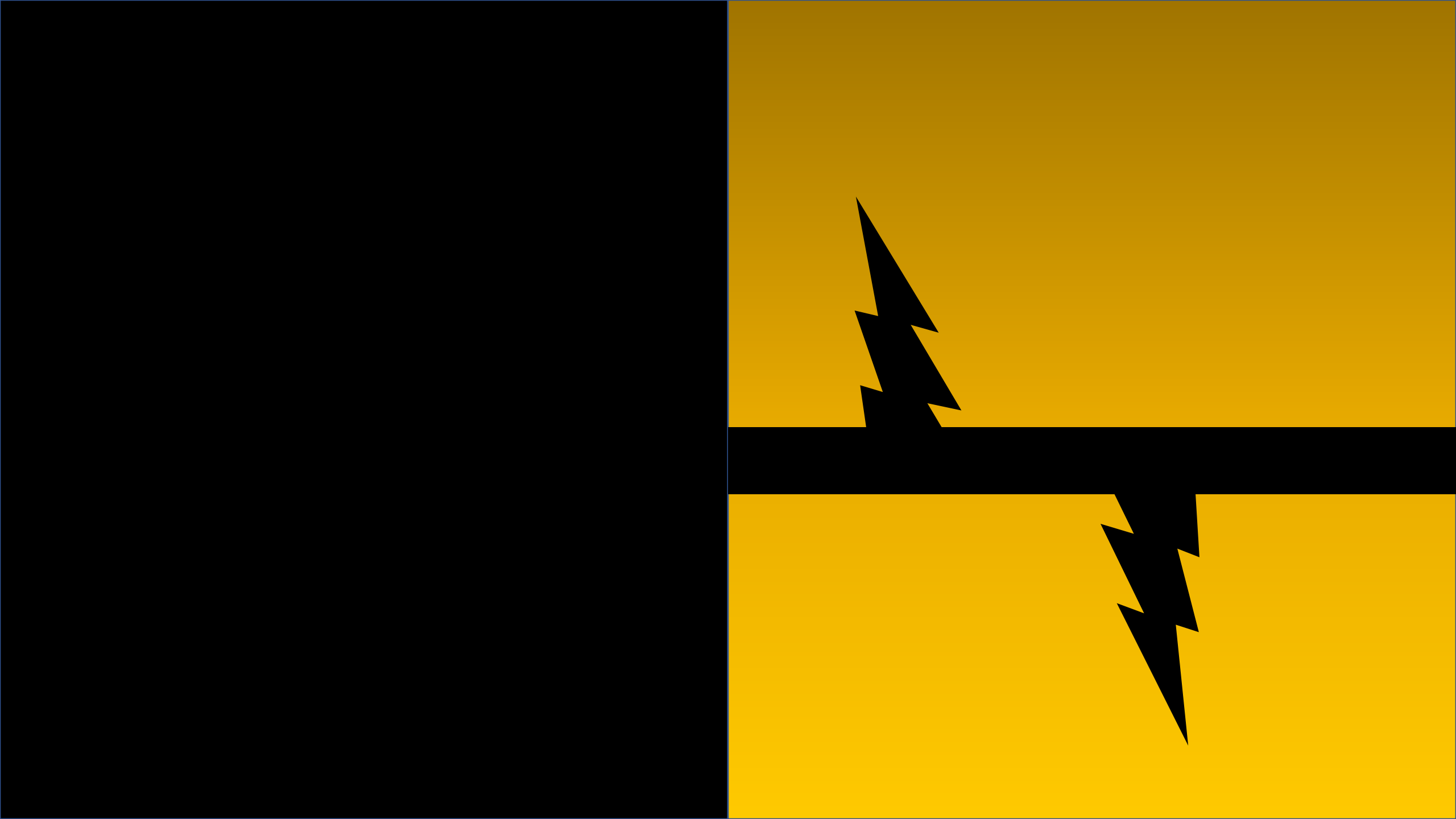
February 15-18, 2021

Dr.-Ing. Natalia Realpe Carrillo
natalia@hedera.online









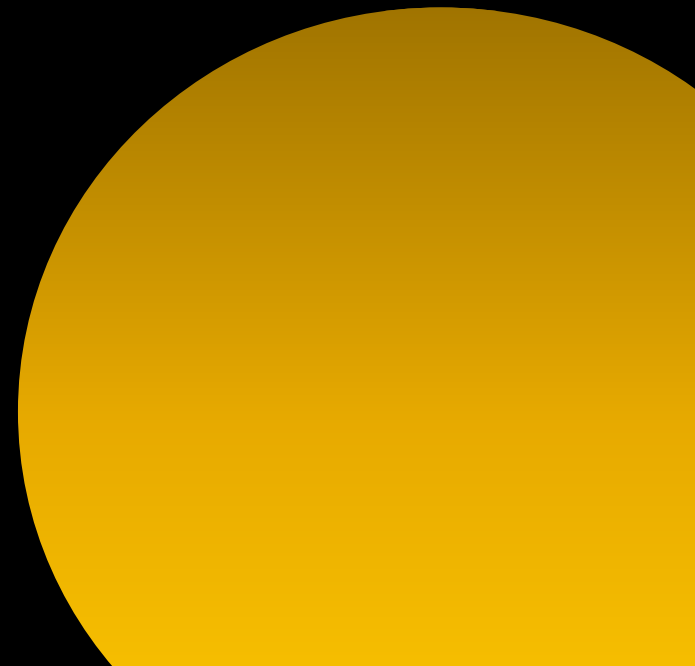
















Photo: SunnyMoney Microsolar Project - Fondation Ensemble



Photo: Solar Sister



Photo: SunnyMoney Microsolar Project - Fondation Ensemble

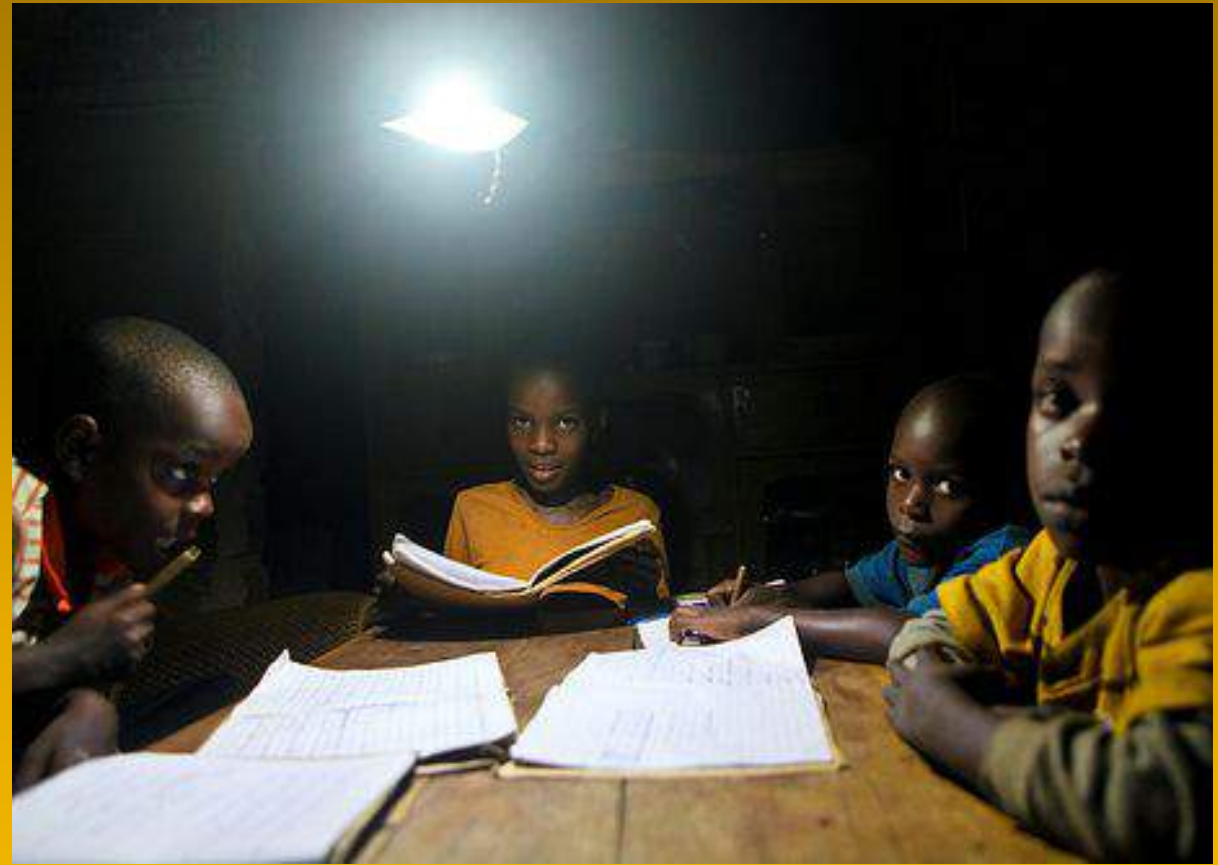


Photo: Solar Sister



Photo: SunnyMoney Microsolar Project - Fondation Ensemble



Photo: Nova Lumus



The Global Tracking Framework and the Multi-Tier Framework

Monitoring and evaluating energy access by following a multidimensional approach

77889

SUSTAINABLE
ENERGY FOR ALL

v.3



Public Disclosure Authorized

Public Disclosure Authorized

Public Disclosure Authorized

GLOBAL TRACKING FRAMEWORK





Bhatia, M. and Angelou, N. (2015). BEYOND CONNECTIONS Energy Access Redefined







ATTRIBUTES TO ASSESS ENERGY ACCESS

CAPACITY

Quantity of energy made
available to the user



RELIABILITY

Absence of unpredictable
outages of energy supply



QUALITY

Implies correct level and stability of voltage / absence of adulteration



AVAILABILITY/ DURATION

Ability to draw energy when
needed for use of energy
services



SECURITY

Risk of injury from the energy supply



FORMALITY/ LEGALITY

Using the energy supply, the end user is not indulging in any activity proscribed by law



HEALTH

Risk of adverse health
consequences from the use of
energy



AFFORDABILITY

Ability of the end user to pay for energy needed for a defined package of energy consumption





CONVENIENCE

Time spent acquiring
(through collection or
purchase) fuel and preparing
fuel and the stove for cooking



SAFETY

Safety in using the most used
cookstove within the
household



AFFORDABILITY

Household's ability to pay for both the cookstove and fuel



FUEL AVAILABILITY

Availability of fuel when
needed for cooking purposes



COOKING EXPOSURE

Personal exposure to pollutants from cooking activities, which depends on

- Stove emissions
- Ventilation structure
- Contact time



COOKING EFFICIENCY

Performance of the stove in regard to its thermal efficiency





Electricity access is measured based on the combination of seven attributes of energy across six tiers of access with minimum requirements by tier of electricity access





ESMAP Illustration

ATTRIBUTES		TIER 0	TIER 1	TIER 2	TIER 3 ^b	TIER 4	TIER 5
Capacity	Power capacity ratings (W or daily Wh)	Less than 3 W	At least 3 W	At least 50 W	At least 200 W	At least 800 W	At least 2 kW
		Less than 12 Wh	At least 12 Wh	At least 200 Wh	At least 1 kWh	At least 3.4 kWh	At least 8.2 kWh
	Services		Lighting of 1,000 lmhr per day	Electrical lighting, air circulation, television, and phone charging are possible			
Availability ^a	Daily Availability	Less than 4 hours	At least 4 hours		At least 8 hours	At least 16 hours	At least 23 hours
	Evening Availability	Less than 1 hour	At least 1 hour	At least 2 hours	At least 3 hours	At least 4 hours	
Reliability		More than 14 disruptions per week			At most 14 disruptions per week or At most 3 disruptions per week with total duration of more than 2 hours"	(> 3 to 14 disruptions / week) or ≤ 3 disruptions / week with > 2 hours of outage	At most 3 disruptions per week with total duration of less than 2 hours
Quality		Household experiences voltage problems that damage appliances				Voltage problems do not affect the use of desired appliances	
Affordability		Cost of a standard consumption package of 365 kWh per year is more than 5% of household income			Cost of a standard consumption package of 365 kWh per year is less than 5% of household income		
Formality		No bill payments made for the use of electricity				Bill is paid to the utility, prepaid card seller, or authorized representative	
Health and Safety		Serious or fatal accidents due to electricity connection				Absence of past accidents	



Color signifies tier categorization

		TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
Availability ^a	Daily Availability	Less than 4 hours	At least 4 hours		At least 8 hours	At least 16 hours	At least 23 hours
	Evening Availability	Less than 1 hour	At least 1 hour	At least 2 hours	At least 3 hours	At least 4 hours	
Reliability		More than 14 disruptions per week			At most 14 disruptions per week or At most 3 disruptions per week with total duration of more than 2 hours"	(> 3 to 14 disruptions / week) or ≤ 3 disruptions / week with > 2 hours of outage	At most 3 disruptions per week with total duration of less than 2 hours



Each attribute is assessed separately

		TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
Availability ^a	Daily Availability	Less than 4 hours	At least 4 hours		At least 8 hours	At least 16 hours	At least 23 hours
	Evening Availability	Less than 1 hour	At least 1 hour	At least 2 hours	At least 3 hours	At least 4 hours	





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	TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
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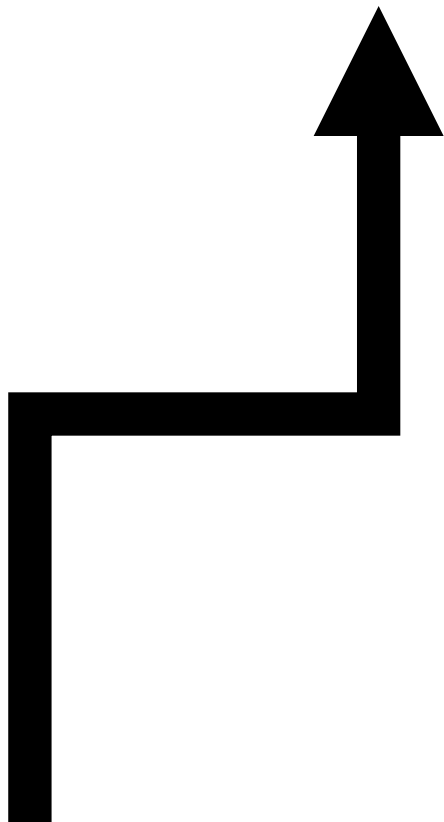


Aggregate tier is based on lowest tier value across all attributes

		TIER 3»			
Availability ^a	Daily Availability			At least 16 hours	At least 23 hours
	Evening Availability			At least 3 hours	At least 4 hours
Reliability					At most 3 disruptions per week with total duration of less than 2 hours

ATTRIBUTES		TIER 0	TIER 1	TIER 2	TIER 3 ^b	TIER 4	TIER 5
Capacity	Power capacity ratings (W or daily Wh)				At least 200 W	At least 800 W	At least 2 kW
					At least 1 kWh	At least 3.4 kWh	At least 8.2 kWh
	Services						
Availability ^a	Daily Availability	At least 4 hours			At least 8 hours	At least 16 hours	At least 23 hours
	Evening Availability	At least 1 hour	At least 2 hours	At least 3 hours	At least 4 hours		
Reliability							At most 3 disruptions per week with total duration of less than 2 hours
Quality							Voltage problems do not affect the use of desired appliances
Affordability							Cost of a standard consumption package of 365 kWh per year is less than 5% of household income
Formality							Bill is paid to the utility, prepaid card seller, or authorized representative
Health and Safety							Absence of past accidents

ATTRIBUTES		TIER 1				
Capacity	Power capacity ratings (W or daily Wh)			At least 200 W	At least 800 W	At least 2 kW
				At least 1 kWh	At least 3.4 kWh	At least 8.2 kWh
	Services					
Availability ^a	Daily Availability	At least 4 hours		At least 8 hours	At least 16 hours	At least 23 hours
	Evening Availability	At least 1 hour	At least 2 hours	At least 3 hours	At least 4 hours	
Reliability						At most 3 disruptions per week with total duration of less than 2 hours
Quality						Voltage problems do not affect the use of desired appliances
Affordability						Cost of a standard consumption package of 365 kWh per year is less than 5% of household income
Formality						Bill is paid to the utility, prepaid card seller, or authorized representative
Health and Safety						Absence of past accidents



7 AFFORDABLE AND
CLEAN ENERGY





ATTRIBUTES		TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
Cooking Exposure	ISO's voluntary performance targets (Default Ventilation) PM2.5 (mg/Mjd) CO (g/Mjd) gn	>1030 >18.3	≤1030 ≤18.3	≤481 ≤11.5	≤218 ≤7.2	≤62 ≤4.4	≤5 ≤3.0
	High Ventilation PM2.5 (mg/Mjd) CO (g/Mjd)	>1489 >26.9	≤1489 ≤26.9	≤733 ≤16.0	≤321 ≤10.3	≤92 ≤6.2	≤7 ≤4.4
	Low Ventilation PM2.5 (mg/Mjd) CO (g/Mjd)	>550 >9.9	≤550 ≤9.9	≤252 ≤5.5	≤115 ≤3.7	≤32 ≤2.2	≤2 ≤1.4
Cookstove Efficiency	ISO's voluntary performance Targets	≤10%	>10%	>20%	>30%	>40%	>50%
Convenience	Fuel acquisition and preparation time (hours per week)	≥7		<7	<3	<1.5	<0.5
	Stove preparation time (minutes per meal)	≥15		<15	<10	<5	<2
Safety		Serious Accidents over the past 12 months				No serious accidents over the past year	
Affordability		Fuel cost ≥5% of household expenditure (income)				Fuel cost <5% of household expenditure (income)	
Fuel availability		Primary fuel available less than 80% of the year				Available 80% of the year	Readily available throughout the year

**ISO = International Organization for Standardization,
PM = Particulate Matter,
CO = carbon monoxide,
Mjd = Mega Joule delivered*



Households

Supply Electricity Consumption Services Cooking Heating

Productive engagements

Community facilities

School Health facilities Government offices Street lighting Community Buildings



1. Gap analysis and diagnostic review

The analysis can provide insights into possible interventions that would enable enhanced access.





2. Information on gender aspects

The multi-tier approach provides information on ownership and use of electrical appliances, use of stand-alone systems, use of mobile phones, and various aspects of cooking.





3. Flexibility of setting target tiers

The approach allows governments (stakeholders) to set their own targets by choosing any tier above Tier 0.





4. Comparison across geographies and over time

The methodology provides a robust tool for measuring access across various locales of energy use, and comparing them across geographies and over time



Digital, Decentralized, Democratized



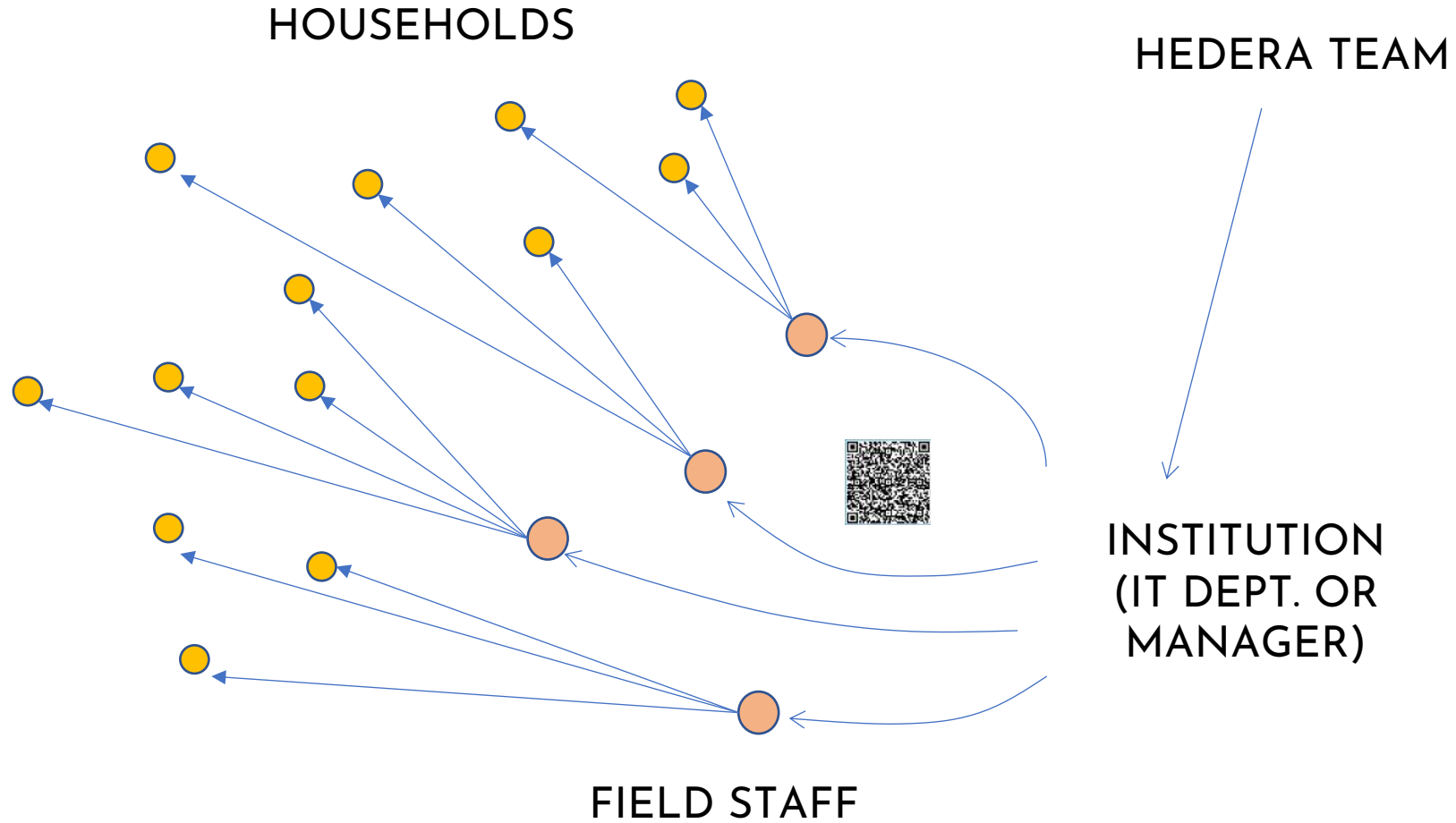
EVERYBODY MATTERS

Digital solutions for measurable and transparent sustainable development

<https://hedera.online>

<https://hit.hedera.online>

Remote installation

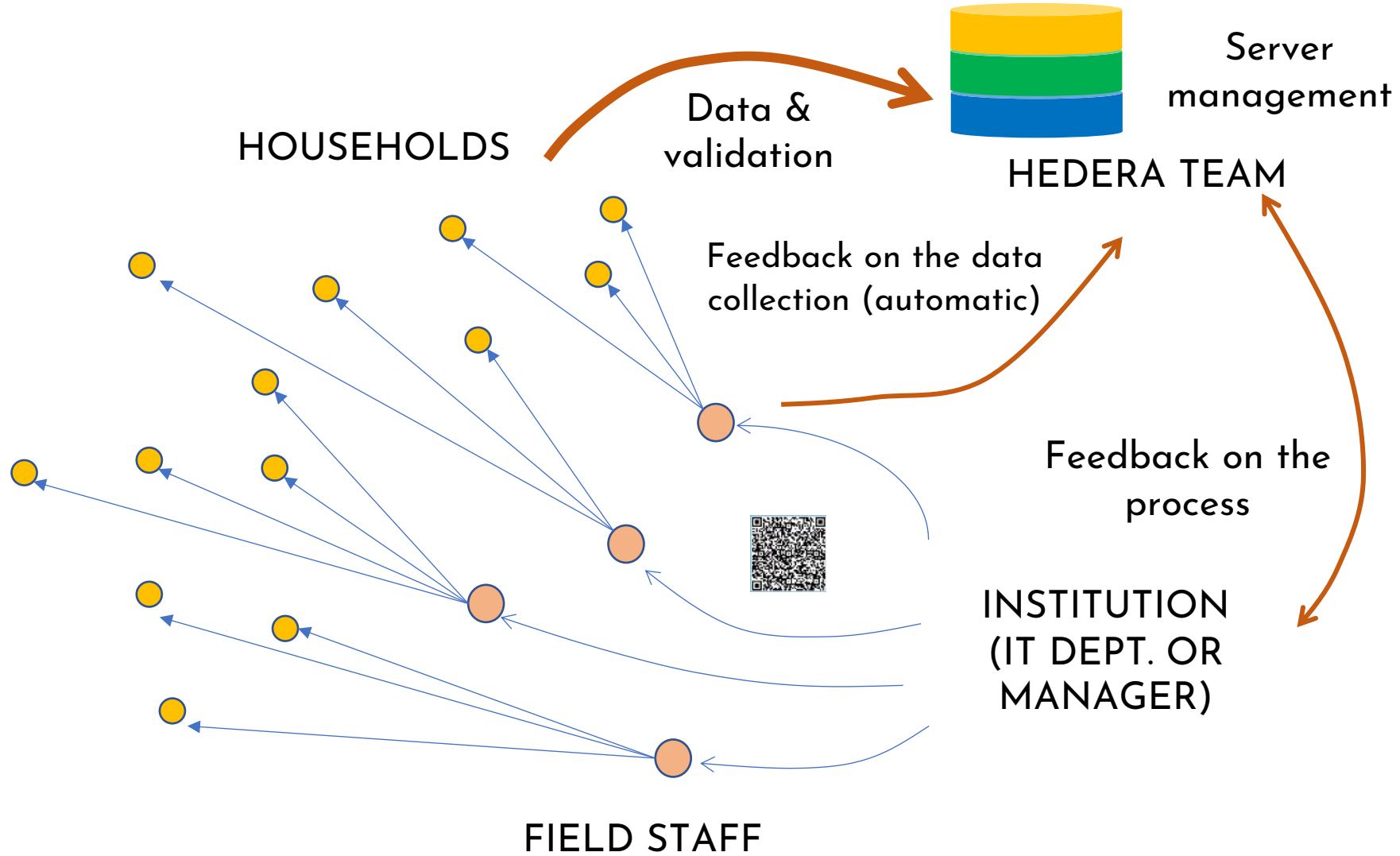


**Train-of-
trainers
approach**



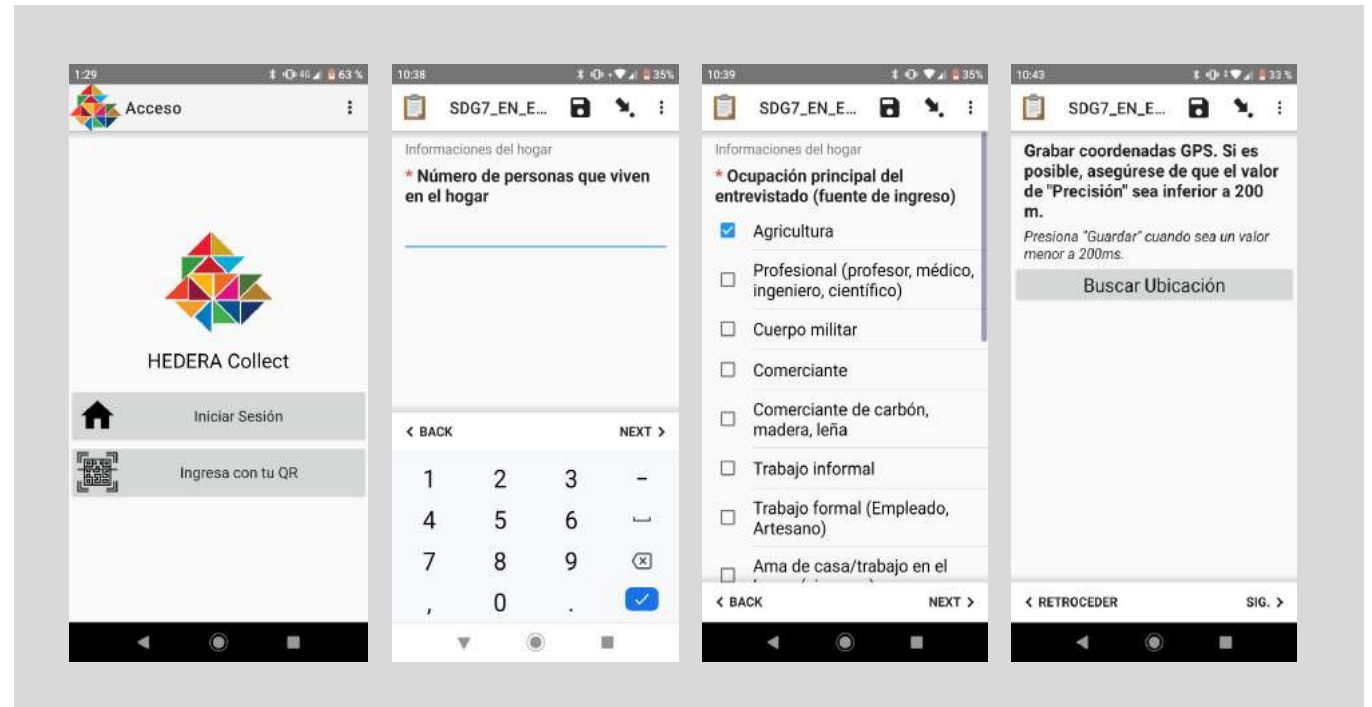
APIDE DRC, Hervé Ilombe 2020

Data processing



IMPACT TOOLKIT HEDERA COLLECT

HEDERA Collect is an open-source mobile application that enables quick, easy data collection in the field, without requiring an internet connection.



Application and surveys available in English, Spanish, French, and Portuguese



IMPACT TOOLKIT HEDERA COLLECT

Data collection app

12:30 33%

HEDERA_SDG7

Electricity

*** Please indicate which electric appliances you have at home.**

Select all the options that apply.

- Mobile phones
- Modem
- Tablet
- Computer
- Printer
- Satellite dish
- TV (black and white)
- TV (color)
- DVD
- Game console
- Radio

< BACK NEXT >

Tutorial app with short videos for providing help in the field



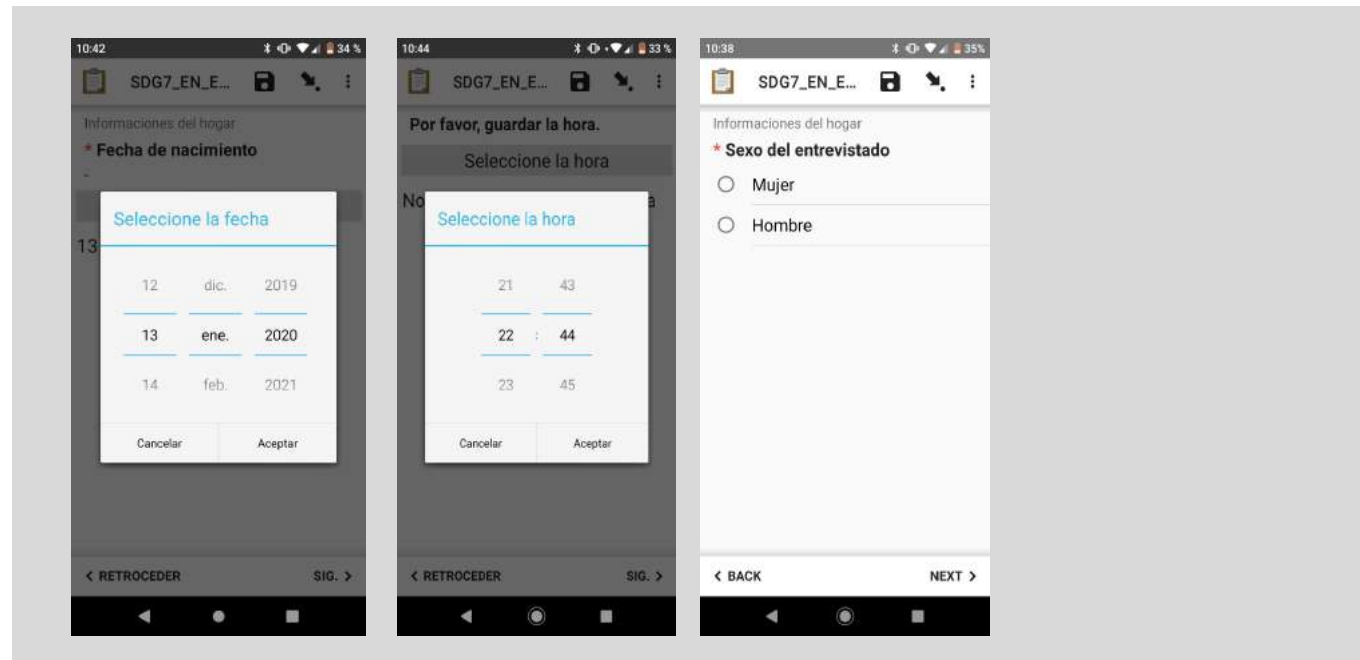
IMPACT TOOLKIT HEDERA COLLECT

Types of data that can be collected:

GPS, date, time, codes, images (photos & selfies), signatures, space plotting (area measurements), answers to multiple choice and open questions, and audio recordings

Data processing features:

Automatic calculations (arithmetic operations) in the application, automatic filters, and data validation through parameter specification





- Home
- About Energy Access
- Map
- Indicators
- Electricity
- Cooking solutions
- FAQ
- My Institution
- Logout

21/05/2020, 14:22:43

See <https://fontawesome.com/license>

Welcome to your impact dashboard



Surveys:
138



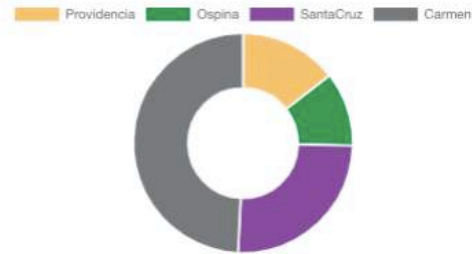
Clients connected to the
grid:
136



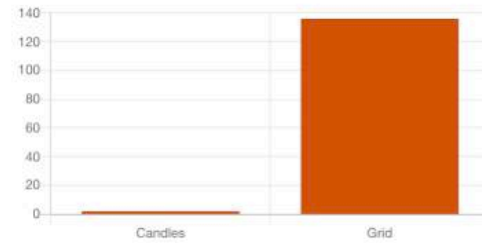
Electricity Index (MTF):
3.76/5

Cooking Index (MTF): 3.57/5

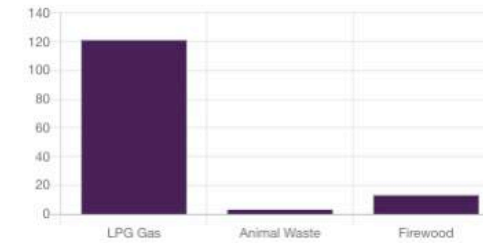
Where do the data come from?



Summary of client power sources



Primary cooking fuels



Surveys per office

Office	Date of first collection	Date of last collection	Total number of surveys
Total	2019-03-05	2019-04-16	138
Providencia	2019-03-05	2019-03-13	20
Ospina	2019-03-13	2019-03-20	15
SantaCruz	2019-03-21	2019-04-04	35
Carmen	2019-04-04	2019-04-16	68

Collection overview (GPS)

[Go to map](#)



Electricity Supply – Multi-Tier Framework Assessment per Household



HEDERA
Rethinking Impact Assessment

- Home
- About Energy Access
- Map
- Indicators
- Electricity
- Cooking solutions
- FAQ
- My Institution
- Logout

21/05/2020, 14:22:52

See <https://fontawesome.com/license>

Multi-Tier Framework: Access to electricity

Background: How to measure access to electricity

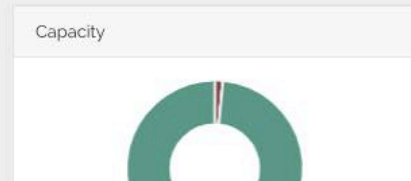
The MTF approach measures energy access provided by any technology or fuel based on seven attributes that capture key characteristics of the energy supply that affect the user experience: Capacity, Availability, Reliability, Quality, Affordability, Legality, and Health and Safety. Based on those attributes, it then defines six tiers of access, ranging from Tier 0 (no access) to Tier 5 (full access) along a continuum of improvement.

Total | Providencia | Ospina | SantaCruz | Carmen

MTF Index: Access to electricity

You can look at the overall results (All) or visualize ranking per office

Total | Providencia | Ospina | SantaCruz | Carmen





Reporte de Acceso a Energía

Buscar

Introducción

El enfoque multinivel (Multi-tier Framework) para medir el acceso a energía

[Recolección de datos](#)

[Resumen de resultados](#)

Acceso a Electricidad

Servicios de Energía

[Aparatos en los hogares](#)

Mapa

El Mapa permite visualizar la ubicación de los datos GPS recopilados. Los puntos de datos faltantes se muestran con coordenadas (0,0)



Fechas de recolección

EN ESA PÁGINA

¿DÓNDE SE RECOLECTARON LOS DATOS?

[MAPA](#)

FECHAS DE RECOLECCIÓN

[ENCUESTAS POR ESTADO](#)

[ENCUESTAS POR OFICINA](#)

[DURACIÓN DE LAS ENCUESTAS](#)

[ENCUESTAS POR USUARIO](#)



Household Study (APIDE)

Introduction

The Multi-Tier Framework for Measuring Energy Access

[Data Collection](#)

[Summary of Results](#)

[Interactive Analysis](#)

Access to Electricity

Power Sources

[Multi-Tier Ranking](#)

[Appliances](#)

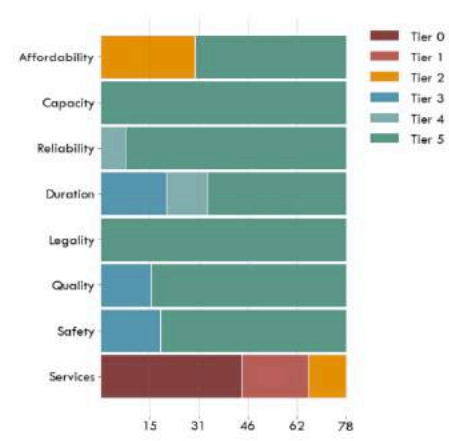
AFFORDABILITY

RELIABILITY

QUALITY

DURATION

Electricity Access Attributes



Attributes of Access to Cooking Solutions



ON THIS PAGE

SUMMARY OF RESULTS

[ELECTRICITY ACCESS ATTRIBUTES](#)

[ATTRIBUTES OF ACCESS TO COOKING SOLUTIONS](#)

Energy access analysis, Mexico (July/August 2019)

Energy access analysis, DRC (Jan/Feb 2020)



Household Study (APIDE)

Introduction

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[Data Collection](#)

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[Interactive Analysis](#)

Access to Electricity

Power Sources

[Multi-Tier Ranking](#)

[Appliances](#)

AFFORDABILITY

RELIABILITY



Data Collection Summary

This section provides an overview of the location of households surveyed, survey collection dates and regions, and individual survey duration.

Data Collection Map

The map shows the GPS coordinates of all households covered in the mobile survey.

Note: Only the valid GPS records are shown.



ON THIS PAGE

DATA COLLECTION SUMMARY

[DATA COLLECTION MAP](#)

SURVEY COLLECTION DATES

OVERVIEW OF SURVEYS PER LOCATION

SURVEY DURATION



Cooking stoves as per tier ranking

LEGALITY

SAFETY

Access to Modern Cooking Solutions

Cooking Stoves and Cooking Fuels

[Multi-Tier Ranking](#)

[Pictures of Cooking Stoves](#)

CONVENIENCE

AFFORDABILITY

AVAILABILITY

SAFETY

HEDERA

[The HEDERA Impact Toolkit](#)

[About us](#)



ON THIS PAGE

COOKING STOVES

[COOKING TIER 0](#)

[COOKING TIER 1](#)

[COOKING TIER 3](#)

Pictures of Cooking Stoves

Cooking Stoves

This page presents photos of the household cooking stoves, organized per MTF tier, taken during data collection.

Cooking Tier 0 [↗](#)

Cooking stoves of households in **Tier 0**





Household Study (APIDE)

[Introduction](#)

The Multi-Tier Framework for
Measuring Energy Access

Data Collection

Summary of Results

[Interactive Analysis](#)

Access to Electricity

Power Sources

Multi-Tier Ranking



Interactive Analysis

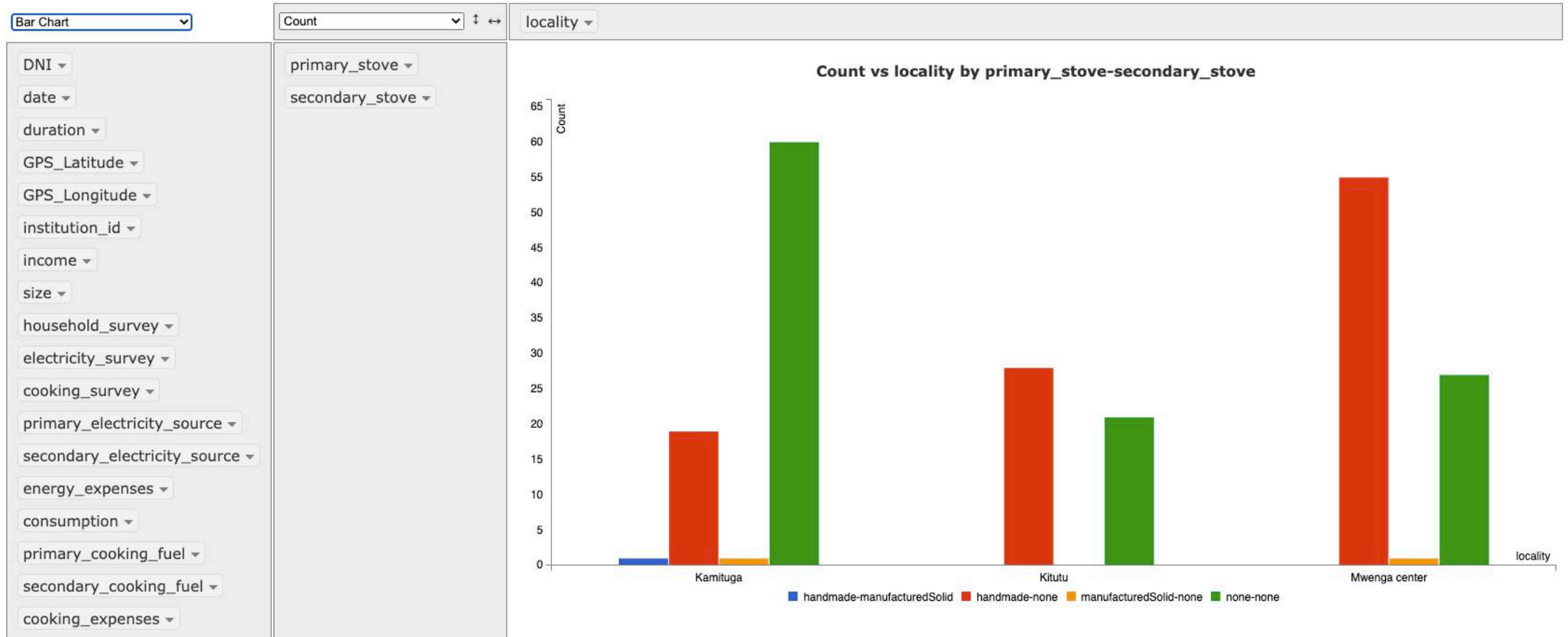
INTERACTIVE ANALYSIS

With the interactive analysis feature, you can compare variables whose graphs or tables are not in the automated digital report. You can simply drag and drop the variables to display them in the x or y axis of the table/graph.

[\[pop out\]](#)

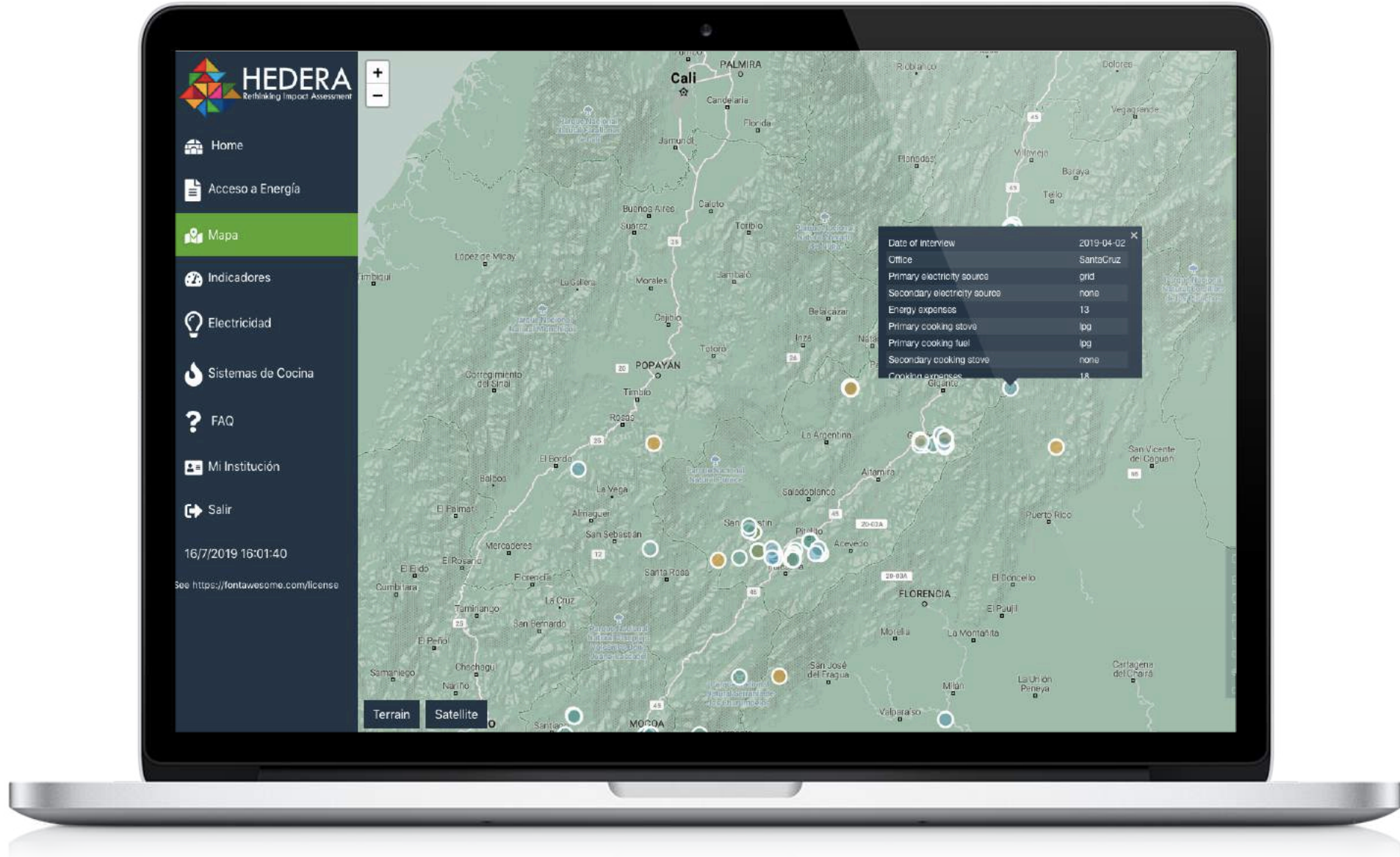
The screenshot shows a user interface for interactive analysis. At the top, there are two dropdown menus: 'Table' and 'Count'. Below these, a list of variables is displayed in a light gray box, each with a dropdown arrow: 'DNI', 'date', 'duration', 'GPS_Latitude', and 'GPS_Longitude'. To the right of the variable list is a large empty rectangular area, likely for a graph or table. A small 'T' icon is visible on the right edge of the interface. A plus sign icon is located in the top right corner of the overall page.

Flexible graphs/tables

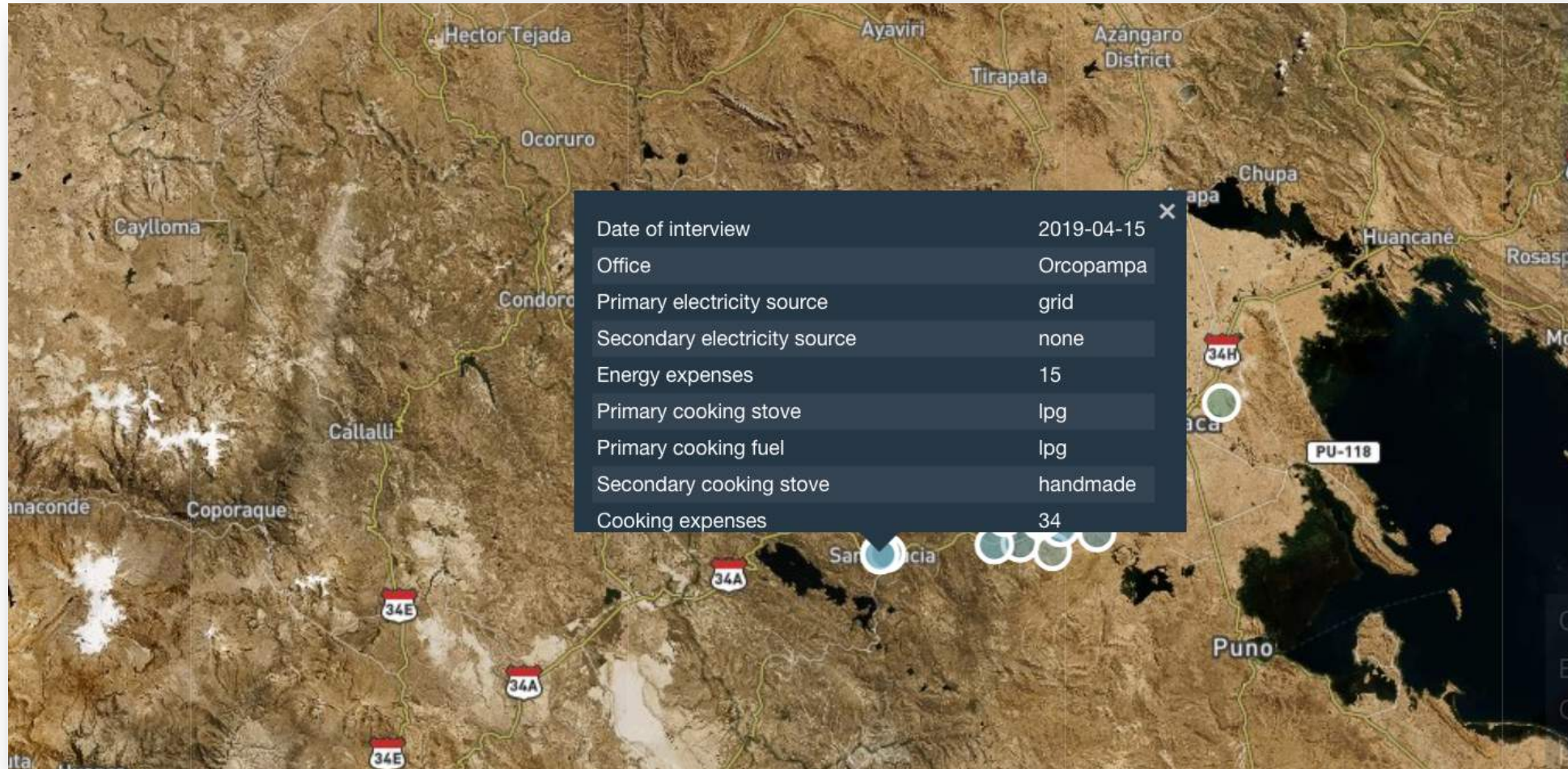




Maps – filters per power source / cooking stove and fuels



Indicators household-based



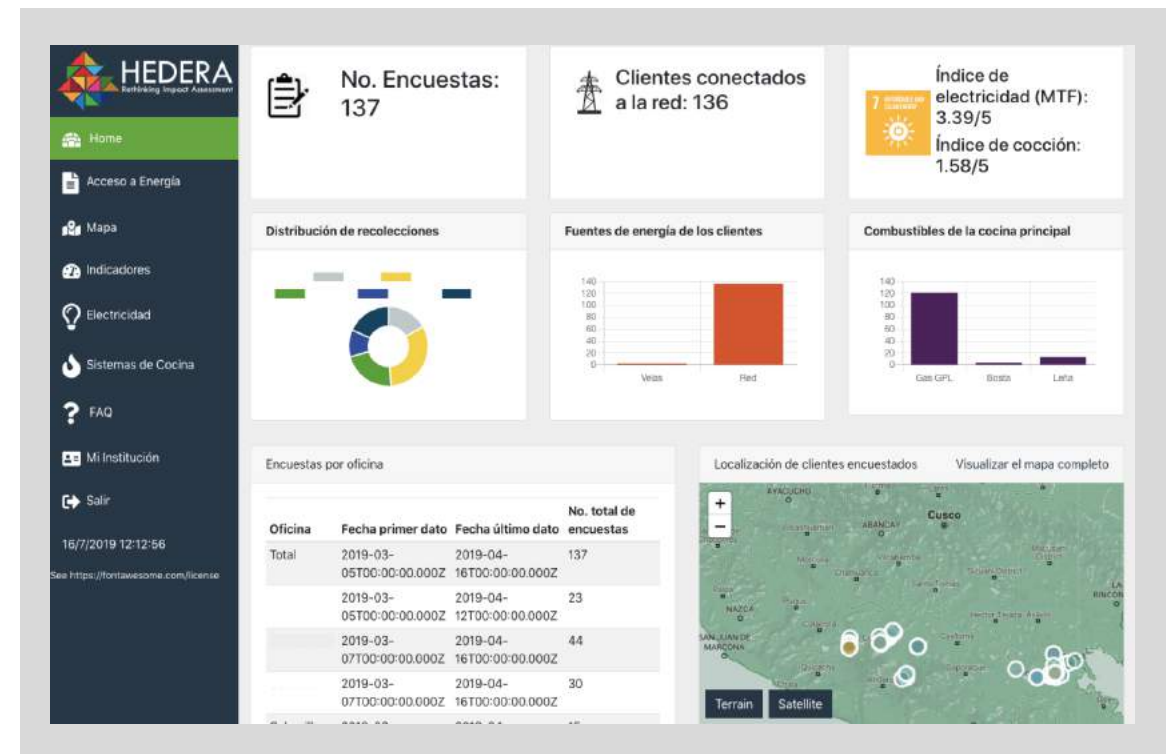
Data Collection in Peru

Market Research on Need for Green Loan Product Expansion



April - June 2019

- Execution of the digital tool in a period of two months through telephone calls.
- The installation, recruitment, and training of the survey team were done remotely.
- Loan officers collected the GPS coordinates locally, and GPS data were merged with other survey data.



Data Collection in Peru

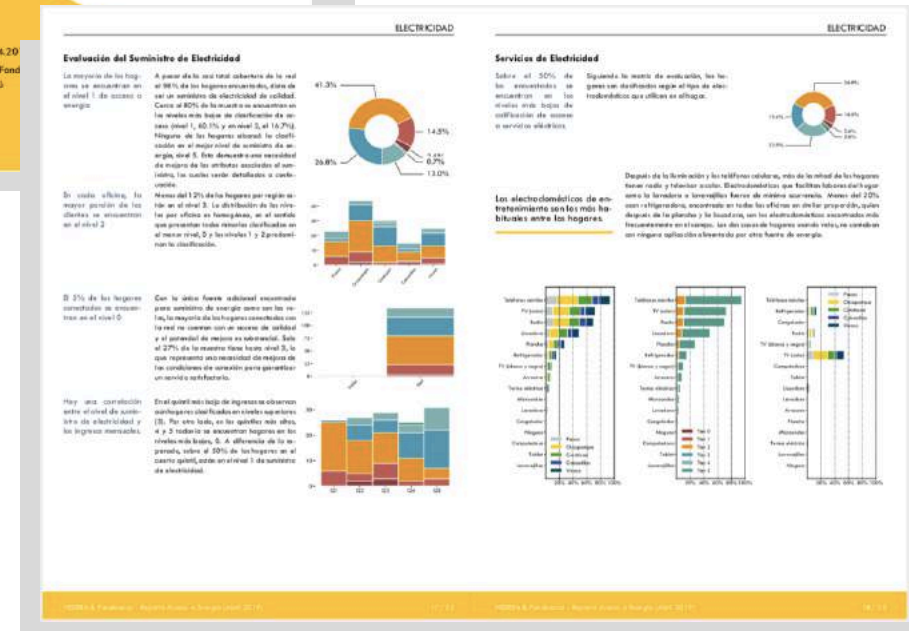
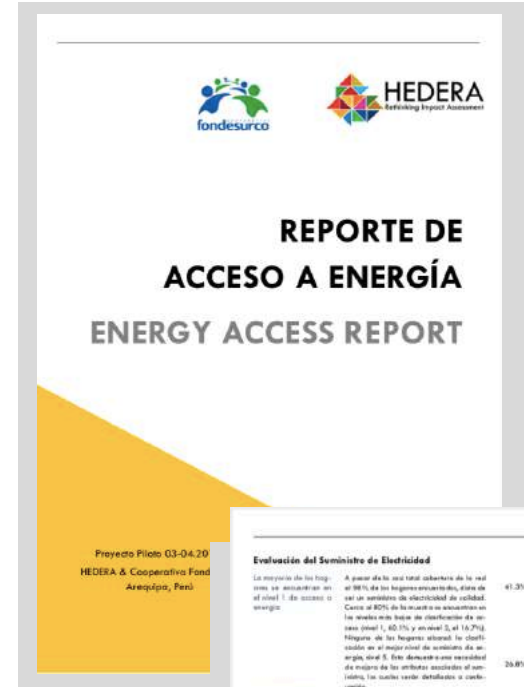
Market Research on Need for Green Loan Product Expansion



April - June 2019

Validation of:

- Survey on access to basic energy services and digitization of the institution's questions
- Dashboard
- Digital reports
- Georeferencing and filtering of results



Analysis of Energy Needs Throughout Mexico



July 2019

Execution of the digital tool in a period of one week through the MFI's credit advisors. Remote installation by the MFI's IT department and loan officer training through the HEDERA Collect tutorial app.

Collection overview

Map
The Map allows to visualize the location of the collected GPS data. Missing data points are displayed with coordinated (0,0)

Case studies - household energy access

Search

Introduction

The Multi-tier Framework for Measuring Energy Access

Case Studies

- Te Creemos
- Cooperativa Fondesurco
- Kenya (field research)
- HEDERA

Map data per location
Data have been collected in more than 80 offices of the institution, covering all departments of Mexico.

ON THIS PAGE

- METHODOLOGY
- COLLECTION OVERVIEW
- MAP
- DATA PER LOCATION
- DATES OF COLLECTION
- AVERAGE DURATION
- ACCESS TO ELECTRICITY
- ATTRIBUTES
- MTF INDEX (ACCESS TO ELECTRICITY)
- POWER SOURCES
- PRIMARY SOURCES OF ELECTRICITY AND ILLUMINATION
- SECONDARY SOURCES OF ELECTRICITY AND ILLUMINATION
- MTF ELECTRICITY INDEX VS. PRIMARY SOURCE
- ACCESS TO COOKING SOLUTIONS
- PRIMARY COOKING FUELS
- ATTRIBUTED DESCRIBING ACCESS TO COOKING SOLUTIONS
- MTF INDEX (COOKING SOLUTIONS)
- MTF INDEX (ACCESS TO COOKING SOLUTIONS) VS. PRIMARY COOKING FUEL

SDG 7 Baseline Assessment in DRC



Jan - Feb 2020

- Provision of mobile application for data collection, as well as digital material for remote training, to conduct their market assessment in their outreach area.
- APIDE field staff were trained during a one-day workshop (held by one member of the organization).
- The trained team interviewed more than 220 households over a period of 10 days.

The screenshot displays a mobile application interface for a baseline assessment. On the left is a sidebar menu with categories: AFFORDABILITY, RELIABILITY, QUALITY, DURATION, LEGALITY, SAFETY, Access to Modern Cooking Solutions, CONVENIENCE, AFFORDABILITY, AVAILABILITY, SAFETY, and HEDERA. The main content area is titled 'Pictures of Cooking Stoves' and includes a section for 'Cooking Tier 0' with a photo of a household stove. Below this is a 'Household Study (APIDE)' section with a sub-menu: Introduction, The Multi-Tier Framework for Measuring Energy Access, Data Collection, Summary of Results, and Interactive Analysis. To the right, a 'Summary of Results' section features a horizontal bar chart titled 'Electricity Access Attributes' showing tier rankings for Affordability, Capacity, Reliability, Duration, Legality, Quality, Safety, and Services. A legend on the right of the chart identifies five tiers: Tier 0 (dark red), Tier 1 (red), Tier 2 (orange), Tier 3 (blue), Tier 4 (teal), and Tier 5 (green).

Attribute	Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
Affordability	0	0	1	0	0	4
Capacity	0	0	0	0	0	5
Reliability	0	0	0	0	0	5
Duration	0	0	0	2	1	2
Legality	0	0	0	0	0	5
Quality	0	0	0	1	0	4
Safety	0	0	0	1	0	4
Services	2	1	1	0	0	0

CASE 1

- Call center data collection + GPS data collected in-situ
- Easy coordination
- Reduced number of people involved
- Missed opportunity for awareness raising of staff

CASE 2

- Remote installation to staff mobile phones coordinated by MFI's IT department
- Support from IT dpt
- Impressive outreach in few days
- If the institutions is already advanced in the use of digital tools (e.g., mobile app for customer surveys), it is preferred to design API and include the energy access questionnaire in the existing system

CASE 3

- Remote training for the field staff
- Data collection during household visits (mostly offline)
- Staff motivation is a key (in this case, high motivation due to clear needs)
- Repeated training & feedback to staff would be helpful



Baseline establishment

Establish a global baseline of energy access, starting in 10-15 high access deficit countries based on the multifaceted definition according to MTF



Transfer capacities

Transfer capacity to national statistical offices to keep tracking progress toward SE4ALL goals and SDG in the future



Tools improvement

Continue improving tools and capacities for tracking progress towards reaching the SE4ALL objective of universal access to modern energy services by 2030, based on MTF



Sharing data

Provide reliable data on energy sector that can meet needs of multiple stakeholders*

**government, regulators, utilities, project developers, civil society organizations, developmental agencies, financial institutions, appliance manufacturers, international programs and the academia*

HEDERA's Shared Objectives with ESMAP – Multi-Tier Framework

 **Baseline establishment**

 **Transfer capacities**

 **Tools improvement**

 **Sharing data**

Thank you!

natalia@hedera.com

<https://hedera.com>



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