

ENERGY ASSESSMENT TOOLKIT

A community
focused approach
for identifying
energy needs
and market
opportunities

Eric Verploegen
April 2017

D-Lab



ACKNOWLEDGEMENTS

The Energy Assessment Toolkit was developed in collaboration with Mercy Corps. The author would like to acknowledge the following people for their valuable contributions to this resource:

Anish Paul Antony, Rebecca Smith, Caroline Morris, Kendra Leith, Shanti Kleiman, Nancy Adams, Lauren McKown, Brennan Lake, Eadaion Ilten, and D-Lab's community partners including ASAPROSAR in El Salvador, Mercy Corps Mali, Mercy Corps Nigeria, Mercy Corps Niger, and the People's Science Institute in India.

Funding for this work was generously provided by:

Malcom Standburg, Community Jameel, Paul Antony, Mercy Corps, and the Shell Foundation.

.....
D-Lab's Energy Assessment Toolkit version 1.02 released April 25, 2017.
.....

Publicly available and open source:

D-Lab

This document is the introduction to MIT D-Lab's *Energy Assessment Toolkit*. The full toolkit is available for download at:
<http://d-lab.mit.edu/off-grid-energy/roadmap/assessment-toolkit>



D-Lab's Energy Assessment Toolkit was developed in partnership with Mercy Corps. For information on Mercy Corps' energy access programs visit:
<http://www.mercycorps.org/research-resources/energy-access>



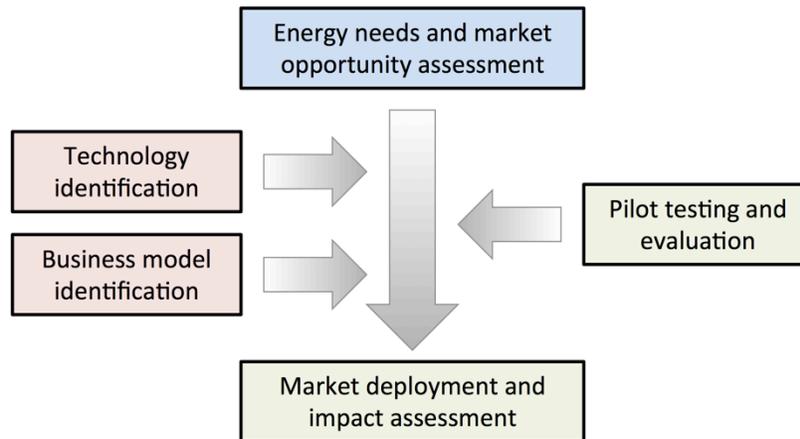
This work is licensed under the Creative Commons Attribution-ShareAlike 4.0 International License. To view a copy of this license visit:
<http://creativecommons.org/licenses/by-sa/4.0/>

If you choose to repost, reuse, or modify these materials you must give proper attribution to MIT D-Lab, and you must include a copy of the Attribution-ShareAlike Creative Commons license, with every copy of the MIT D-Lab materials or the derivative work you create from it. For derivative work, please use the following citation format:

[Name of derivative work] is modified from work by [MIT D-Lab's Off-Grid Energy Group](#) (Accessed on [insert date]), licensed under a [Creative Commons Attribution-ShareAlike 4.0 International License](#).

EXECUTIVE SUMMARY

The effective development of energy access programs or businesses requires knowledge of the local energy access landscape and broader societal context. Understanding the energy needs and market opportunities in the specific off-grid community or region is the first step in D-Lab's *Off-Grid Energy Roadmap* shown below:



In support of organizations looking to address energy access challenges in communities where they work, MIT D-Lab's Off-Grid Energy group has developed the *Energy Assessment Toolkit*. This toolkit is designed to guide organizations through the process of gathering the information needed to make informed decisions about what technologies and business models are best suited to meet the specific needs in their community through market based initiatives.

The *Energy Assessment Toolkit* is a set of documents and files that can be used to gather and analyze information about the current energy access, aspirational energy needs, existing supply chain, and stakeholders in the communities of interest. There are three types of documents in the toolkit are organized by color and letter:

- "A" Data collection tools**
- "B" Data analysis and visualization tools**
- "C" Training and supporting documents**

The name of each file begins with a unique letter (indicating the file type) and number combination (A1, A2, A3, ..., B1, B2, ..., etc.). The toolkit is designed to be modular so that the organization conducting the assessment can determine the scope and scale of the assessment.

This document is an introduction to the *Energy Assessment Toolkit*. The full toolkit is available for download on Google Drive (<http://bit.ly/DlabEAT>), and additional information can be found at the D-Lab Off-Grid Energy Group website (<http://d-lab.mit.edu/off-grid-energy>).

TABLE OF CONTENTS

Acknowledgements	2
Executive Summary	3
Table of Contents	4
Background	5
Off-Grid Energy Roadmap	6
Energy Assessment Toolkit Overview	8
Energy Assessment Toolkit Components	9
“A” Data Collection Tools	10
“B” Data Analysis and Visualization Tools	12
“C” Training and Supporting Documents	13
Using the Energy Assessment Toolkit	14
Getting Started	14
Key Considerations	15
Photo Descriptions and Credits	16

BACKGROUND

Background

MIT D-Lab works with people around the world to develop and advance collaborative approaches and practical solutions to global poverty challenges. The program's mission is pursued through interdisciplinary courses, research in collaboration with global partners, technology development, and community initiatives — all of which emphasize experiential learning, real-world projects, community-led development, and scalability.

Roughly 1.3 billion people lack access to modern energy services such as affordable and reliable heating, cooking, mechanical power, transportation, lighting, and telecommunications services. Energy access is essential for providing clean water and sanitation, increasing productivity, promoting economic development, improving health, and reducing poverty.

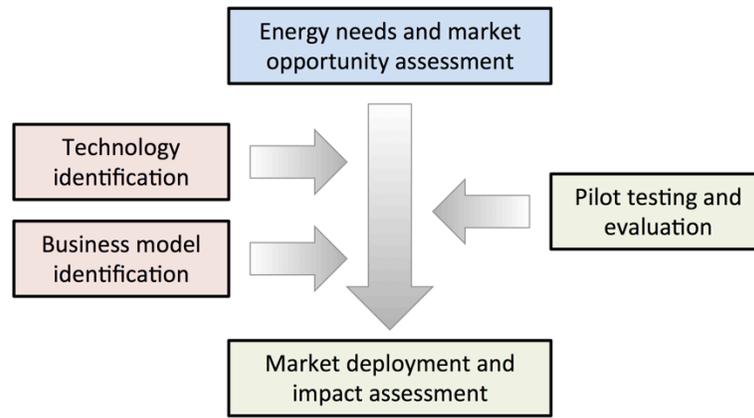
Most approaches for increasing energy access focus on growing existing enterprises or expanding specific initiatives to new markets. Multilateral and national aid organizations often look to support interventions in the regions that have the largest populations with the most severe energy needs. Private sector actors naturally focus on the markets that are most attractive for the products or services that they are disseminating. While these are certainly reasonable approaches given the position of these stakeholders, this situation can leave many regions or communities without pathways for addressing their energy needs.

Community based organizations, NGOs, and businesses based in off-grid communities are well positioned to select and implement the solutions to meet the energy needs of their community, particularly in places that are not targets for interventions from aid agencies or priority markets for solution providers.

D-Lab's Off-Grid Energy Group works to address energy access challenges by providing local organizations with the tools to identify the most pressing needs and market opportunities in a specific community or region. This represents a shift from a top-down approach, in which the solution provider seeks new markets suitable for their products, to a bottom-up approach in which local organizations drive the needs assessment, solution identification, and implementation process in the specific region or community where they work. By providing these local organizations with actionable roadmaps for accessing renewable energy solutions, such as efficient cookstoves, solar lighting, water pumps, and mechanical devices for increased productivity, they can create demand for solutions that might not reach the community otherwise.

Off-Grid Energy Roadmap

In support of local organizations seeking to increase energy access in their own communities, we have developed the *Off-Grid Energy Roadmap*, shown below:



This roadmap is designed for any organization that has an on-the-ground presence in an off-grid community or region, and has the ability to take action based on the opportunities identified. Organizations do not need to have specific expertise in the energy sector, and could include civil society organizations (CSOs), non-governmental organizations (NGOs), local governments, individual entrepreneurs, and small businesses. The three steps along the *Off-Grid Energy Roadmap* are described below.

Energy Needs and Market Opportunity Assessment

The effective development of energy access programs or businesses requires an understanding of the local energy access landscape and broader societal context. D-Lab has developed the *Energy Assessment Toolkit* to guide organizations through the process of gathering and analyzing information about the current energy access, aspirational energy needs, existing supply chain, and stakeholders in the communities of interest. This document provides an introduction for D-Lab's *Energy Assessment Toolkit*, which is available for download at: d-lab.mit.edu/off-grid-energy/roadmap/assessment-toolkit



Conducting an interview with a shop owner in Kenya

Technology and Business Model Identification

There are many technologies, products, and business models that have been developed to address a wide range of energy related issues. Once the most pressing needs and market opportunities have been identified in a specific community or region, the next step is for the implementing organization to determine an approach for increasing energy access that is practicable and effectively leverages their local capabilities. D-Lab is developing and curating resources in order for organizations to build their capacity to make informed decisions about what technologies and business models are best suited to meet the specific needs in their community. These resources for technology and business model identification can be found at: <http://d-lab.mit.edu/off-grid-energy/resources/>



Using an electric grinder in Ghana



Charging a solar-powered lighting system in Nepal

Pilot and Market Deployment

Once potential technologies and business models are identified, an implementing organization can conduct pilots to evaluate the efficacy of the solutions identified. Based on the results of such pilots, the selected program or business approaches can be iterated and further tested, or moved toward wider market deployment.



Selling eco-friendly charcoal in Nairobi, Kenya



Demonstrating a solar lantern to customers in Morocco

Energy Assessment Toolkit

The toolkit includes a series of surveys, interview guides, and data analysis tools that allow implementing organizations to gather and analyze information from a range of stakeholders, such as community residents, business owners, government officials, and other relevant institutions in the following areas:

- Current energy access and expenditures
- Aspirational energy needs
- Existing supply chain
- Community institutions and stakeholders (private sector, government, NGO)

The *Energy Assessment Toolkit* is designed to be modular so that the organization conducting the assessment can determine the scope and scale of the assessment, with the goal of collecting the information needed to make informed decisions about how to meet the specific needs in their community through market based initiatives. This community based assessment approach is not intended to replace studies that track energy access on a national level, or to generate market intelligence reports for external organizations looking to expand their business or programs into new markets.

In addition to the data collection tools, the toolkit includes data entry and visualization tools that can be used to analyze the data collected, as well as to guide the design of the assessment plan by identifying technologies and business models that effectively address the most pressing needs in a specific community or region.



Preparing for an interview in Segou, Mali

The documents and files that comprise the *Energy Assessment Toolkit* are described in the following section, “Energy Assessment Toolkit Components”, and are available for download at: <http://d-lab.mit.edu/off-grid-energy/roadmap/assessment-toolkit>

We have piloted this assessment process with organizations based in off grid regions in Latin America, West Africa, and India. If you have any questions regarding the *Energy Assessment Toolkit*, or are interested in working with D-Lab to conduct an assessment of the energy needs and market opportunities in off-grid communities where you work, please contact Eric Verploegen at ericv@mit.edu

ENERGY ASSESSMENT TOOLKIT COMPONENTS

The *Energy Assessment Toolkit* consists of the three types of files described below, which are designated by color and letter. The name of each file begins with a unique letter (indicating the file type) and number combination (A1, A2, A3, ..., B1, B2, ..., etc.)

“A” Data collection tools

These tools include templates and guides for conducting:

- Surveys
- Interviews
- Focus group discussions

You should translate and edit questionnaires based on the local context.



“B” Data analysis and visualization tools

These interactive (Microsoft Excel) tools are used for:

- Planning your assessment
- Data entry
- Data processing
- Data visualization
- Data analysis
- Decision making



“C” Training and supporting documents

These supporting documents include:

- Training guides
- User guides for other tools
- Information on specific technologies
- Example assessment results



All of the files are available for download on Google Drive (<http://bit.ly/DlabEAT>).

Name ↑	Owner	Last modifi...	File size
A Data collection tools	Eric Verploegen	7:16 PM	—
B Data analysis and visualization tools	Eric Verploegen	7:16 PM	—
C Training and supporting documents	Eric Verploegen	7:16 PM	—
Energy Assessment Toolkit Introduction (v1.0).pdf	Eric Verploegen	7:18 PM	4 MB

On Google Drive, the full toolkit can be downloaded as a zip file, or specific files can be downloaded individually.

“A” Data collection tools

This set of interview, survey, and focus group discussion templates can be used for gathering information from households, businesses, community institutions, and other stakeholders. Each file name begins with “A” and a unique number (A1, A2, A3, ...). These documents are Microsoft Word files (with the exception of A2 which is a Microsoft Excel file for use with the tablet based software <http://ona.io>), and are intended to be modified by the use as needed.

Some examples of modifications that your organization might need to make:

- Translation of questions and instructions into the relevant local language. If the local language is not a written language, you should translate the data collection tools into the language the data collection team is most comfortable with.
- Edit questions to make them more culturally appropriate, more relevant, or easier to understand.
- Selection of the specific questions or sections that are most important for the specific context and program design needs.

The file “C1 Description of Data Collection Tools (A)” contains information about the purpose of each data collection tool, which can help your organization determine which tools and specific questions are most relevant to include in your assessment.

The file “C7 D-Lab's User Research Framework” (also available online at: <http://bit.ly/DlabURF>), contains information on best practices for conducting interviews and focus groups (pages 22-30) that are directly relevant to the data collection tools included in this toolkit.

Brief descriptions of the “A Data collection tools” are listed on the following page.



Left: Walking to a village in rural Segou, Mali to conduct and assessment

Center: Conducting and interview in Sikasso, Mali

Right: Conducting and interview in Niamey, Niger

Description of "A" Data collection tools		Interview subject	Collection method	Data entry
A1	A1 Household interview (v1.0).docx (full version) - A combination of open-ended and survey style questions, covering household information, energy access, and needs - Can be used alone to assess household energy access and needs	Diverse range of household members	Paper	B1
A1a	A1a Household interview (v1.0).docx - Abbreviated version of the full version of "A1..." - Modules "C, F, H..etc. removed	Diverse range of household members	Paper	B1
A1b	"A1b Household interview (v1.0).docx - Abbreviated version of the full version of "A1..." - Modules "D, G, K..etc. removed	Diverse range of household members	Paper	B1
A2	A2_Household_tablet_survey (v1.0).xlsx - Survey style questionnaire covering general household information and energy access - Intended to be used in combination with A1 or A1a/A1b	Diverse range of household members	Tablet	Web: ona.io
A3	A3 Business interview (v1.0).docx - A combination of open-ended and survey style questions, covering general business information, energy access and needs - Examples: barbers, bakeries, horticulture cooperatives, etc.	Businesses in the community	Paper	B3
A4	A4 Supply chain interview (v1.0).docx - Semi-structured interview with a combination of open-ended and survey style questions, covering business information, energy access, and needs - Any business that is selling products, not just energy products (examples: village shops, retailers, distributors, and wholesalers)	Retail business either in the community or where people from the target community purchase products	Paper	B4
A5	A5 Community institution interview (v1.0).docx - Interview guide for relevant community stakeholders identified throughout the assessment process - Examples: schools, hospitals, religious centers, government institutions, women's groups and community centers.	Community institutions that serve the community or is a gathering place	Paper	-
A5-L	A5-L Community leader interview (v1.0).docx - Interview guide for and overview of the community - It is a good practice to meet with a community leader prior to conducting interviews with other community members	An individual that knows the context of the community and relevant stakeholders	Paper	-
A6	A6 Focus group discussion (v1.0).docx - Used to supplement the household interviews and surveys - Can be used to gather feedback on potentially beneficial technologies identified in the assessment	Groups of 6-10 people - Mixed groups - Group consisting of a target demographic	Paper	-
A6-G	A6-G Focus group discussions - Gender (v1.0).docx - Used to supplement the household interviews and surveys - Specially designed to uncover gender related issues	Multiple options: Mixed group of men and women	Paper	-

“B” Data analysis and visualization tools

The interactive Microsoft Excel files are used for data entry, processing, visualization, and analysis. These tools help the user focus on specific sets of data as well as show this data as a part of the larger picture of how the community works. By using these interactive tools, the user can determine what is most needed by the community and how these needs should be addressed, and in what ways their project can be implemented. The interactive files are the “B” tools.

For all excel files, “Enable Macros**” must be selected for the tool to function properly

Description of "B" Data analysis and visualization tools		Used with data collection tools
B0	B0 Data tracking and analysis guide (v1.0).xlsx <ul style="list-style-type: none"> - A template to enter information on the activities conducted - Includes a dashboard for high-level data gathered at each location where an assessment was conducted - Includes a calendar of planned and accomplished activities - Includes supply chain mapping visualization (in preparation) 	A1, A2, A3, A4, A5, A5-L, A6
B1	B1 Qualitative data entry and analysis (v1.0).xlsx <ul style="list-style-type: none"> - A template to enter the information from semi-structured household interviews - Each column is to be used for one interview - Tables and charts generated for each question 	A1, A2
B2	<i>Data output from the tablet based surveys</i> <ul style="list-style-type: none"> - Data can be viewed online or merged with B1 	A2
B3	B3 Qualitative data entry and analysis (v1.0).xlsx <ul style="list-style-type: none"> - A template to enter the information from semi-structured business interviews - Each column is to be used for one interview - Tables and charts generated for each question 	A3
B4	B4 Qualitative data entry and analysis (v1.0).xlsx <ul style="list-style-type: none"> - A template to enter the information from semi-structured supply chain interviews - Each column is to be used for one interview - Tables and charts generated for each question 	A4
B5	B5 Stakeholder tracking template (v1.0).xlsx <ul style="list-style-type: none"> - A template for entering stakeholders encountered 	A5, A5-L
B6	B6 Focus group data entry and tracking tool (v1.0).xlsx <ul style="list-style-type: none"> - A template for focus group data entry 	A6
B7	B7 Summary table - cooking electricity and productive use (v1.0).xlsx <ul style="list-style-type: none"> - Template for inputting and visualizing data gathered 	A1, A2, A3, A6
B8	B8 Product cost comparison tool (v1.0).xlsx <ul style="list-style-type: none"> - A tool to calculate the relative cost of various products for various periods of time 	All relevant information
B9	B9 Basic business model (v1.0).xlsx <ul style="list-style-type: none"> - A tool to calculate the revenues, expenses and total profit for a business activity 	All relevant information
B10	B10 Project idea analysis (v1.0).xlsx <ul style="list-style-type: none"> - A template for analyzing project ideas 	All relevant information

“C” Training and supporting documents

The “C” documents outline and describe the general processes used in the Energy Assessment Toolkit, and serve as aids for using the “A” and “B” tools.

Additionally, the D-Lab Off-Grid Energy Resources webpage provides connections to resources relating to the following subject areas listed below (available at: <http://d-lab.mit.edu/off-grid-energy/resources/>)

- Key organizations in the off-grid energy sector
- Assessment and evaluation approaches and tools
- Energy technologies and products
- Business support and inclusive business

Brief descriptions of the “C Training and supporting documents” are listed below.

Description of “C” Training and supporting documents	
C0	<p>C0 Implementer and context questionnaire (v1.0).docx</p> <ul style="list-style-type: none"> - Questionnaire covering basic information about the implementing organization and the communities of interest for an assessment - Implementing organization fill out the questionnaire to determine if D-Lab's <i>Energy Assessment Toolkit</i> is suitable for their needs - D-Lab can work with the implementing organization to determine the key areas where additional information may be needed
C1	<p>C1 Description of "A Data Collection Tools" (v1.0).pdf</p> <ul style="list-style-type: none"> - Descriptions of each of the data analysis tool listed on page 11 of this document
C2	<p>C2 Description of "B Data Analysis and Visualization Tools" (v1.0).pdf</p> <ul style="list-style-type: none"> - Descriptions of each of the data analysis and visualization analysis tools listed on page 12 of this document
C3	<p>C3 Training of assessment leads (v1.0).pptx</p> <ul style="list-style-type: none"> - This is a PowerPoint training document that gives an overview of the process and includes exercises for analyzing data and generating project ideas
C4	<p>C4 Example consent form (v1.0).docx</p> <ul style="list-style-type: none"> - This consent form can be used as a template and modified by your organization
C5	<p>C5 Cookstove pictures (v1.0).pptx</p> <ul style="list-style-type: none"> - Contains photographs of
C6	<p>C6 Notes for data collection and data management.docx</p> <ul style="list-style-type: none"> - This is a list of reminders and best practices that should be shared with the data collection team and integrated into the training
C7	<p>C7 D-Lab Scale-Ups User Research Framework.pdf</p> <ul style="list-style-type: none"> - Template for inputting and visualizing data gathered
C8	<p>C8 Example Outputs</p> <ul style="list-style-type: none"> - This folder contains multiple files that are example of the outputs from previous assessments that have been conducted using D-Lab's <i>Energy Assessment Toolkit</i>

USING THE ENERGY ASSESSMENT TOOLKIT

Getting Started

Before starting data collection you should define what the specific goals are for the assessment your organization is conducting, and what resources you have available to conduct the assessment.

D-Lab's User Research Framework contains information about best practices for needs assessment study design, data collection, and data processing. This document is available as part of the Energy Assessment Toolkit (C7 D-Lab's User Research Framework) and online at: <http://bit.ly/DlabURF>. It is recommended that users of D-Lab's *Energy Assessment Toolkit* review the “Quick-Start Guide”, on pages 8-9 of D-Lab's User Research Framework, prior to planning an assessment.

Some key considerations for designing a data collection plan:

- Communities to include in the assessment
 - Total number of locations
 - Travel time to each location
- Members of the data collection team
- Timeline (number of days for data collection)
- Number of each survey, interview, and focus group type to be conducted

Make sure to allocate time for data entry, data analysis, and determining next steps. There is no purpose in collecting data if you are not going to use it!

The “Data collection plan” and “Calendar” tabs in the file “**B0 Data tracking and analysis guide**” can be used to help with designing your data collection plan. Taking into account the travel time between locations it is helpful to think of a practical daily plan for data collection, and then determine how many days you will be collecting data in order to arrive at the total number of surveys, interviews, and focus groups that will need to be conducted.

While it is important to make a plan before starting data collection, you should be flexible and alter your plan as you gather information and take into account logistical considerations. Needs assessments differ from data collection for research projects or monitoring and evaluation of programs in that they do not have the same concerns about sample size and statistical significance. You should be thoughtful about your sampling strategies to ensure that your data is representative of the context where you are working, but there is no specific level of statistical significance that is required.

Remember, the goal of the assessment is for your organization to make informed decisions about what energy access programs could be implemented.

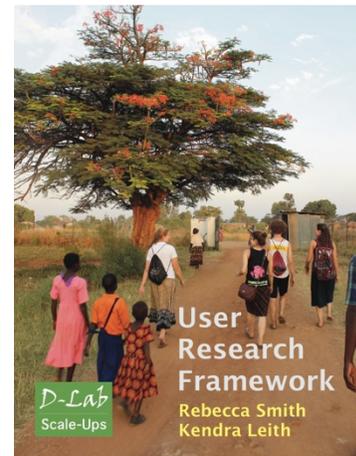
Key considerations for using the Energy Assessment Toolkit:

These assessment tools are only intended to be a guide. Your organization is leading the assessment and should make decisions about the scale and scope of the assessment.

- Only gather the information that will be useful to your organization.
- Implementing organizations should select the modules and questions that are most important for their program design needs.
- Modify the questions at any point as you see fit. For example: to make questions easier to understand, more culturally appropriate, or more relevant.
- You should translate the questionnaires into the relevant local language. If the local language is not a written language, you should translate the questionnaires to the language the data collection team is most comfortable with.

D-Lab's User Research Framework (<http://bit.ly/DlabURF>) provides useful information regarding the following topics:

- Creating a research plan
 - Secondary research and determining research scope
 - Determining the research team, location, budget, and timing
- Data collection and recording techniques
 - Observation
 - Interviewing
 - Immersion
 - Co-design
- Processing and visualizing information
 - Content analysis and coding
 - Mind mapping
 - 2 x2 Matrix creation
 - Affinity diagramming
 - Journey mapping
 - Personal creation



After the most pressing needs and market opportunities have been identified in the communities where you conducted an assessment, you are ready to determine an approach for increasing energy access that is practicable and effectively leverages your local capabilities. D-Lab has developed and curated resources related to energy technologies and business models, which can be found at: <http://d-lab.mit.edu/off-grid-energy/resources/>

If you have any questions regarding D-Lab's *Energy Assessment Toolkit*, or if you have feedback to help us improve on the toolkit, please contact Eric Verploegen at ericv@mit.edu.

PHOTO DESCRIPTIONS AND CREDITS

Cover: Conducting an interview in Sikasso, Mali

© 2017 Eric Verploegen

Page 6 bottom: Conducting an interview with a shop owner in Kenya

© 2014 Rebecca Smith

Page 7 top left: Using an electric grinder in Ghana

© 1996 Saskia Everts, Courtesy of Photoshare

Page 7 top right: Charging a solar-powered lighting system in Nepal

© 2007 Niyam Shrestha, Courtesy of Photoshare

Page 7 bottom left: Selling eco-friendly charcoal in Nairobi, Kenya

© 2007 S. Njuguna, Courtesy of Photoshare

Page 7 bottom right: Demonstrating a solar lantern to customers in Morocco

© 2014 Megha Hegde

Page 8: Preparing for an interview in Segou, Mali

© 2017 Eric Verploegen

Page 9 left: Conducting an interview in Niamey, Niger

© 2017 Lauren McKown

Page 9 center: Analyzing data in Bamako, Mali

© 2017 Lauren McKown

Page 9 right: Conducting a training workshop in Niamey, Niger

© 2017 Lauren McKown

Page 10 left: Walking to a village in rural Segou, Mali to conduct an assessment

© 2015 Annie O'Donnell

Page 10 center: Conducting an interview in Sikasso, Mali

© 2017 Eric Verploegen

Page 10 right: Conducting an interview in Niamey, Niger

© 2017 Lauren McKown