USAID
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POWER AFRICA
A U.S. GOVERNMENT-LED PARTNERSHIP

SOUTHERN AFRICA ENERGY PROGRAM

MALAWI ROUTE-TO-MARKET TOOL TRAINING VIDEO

April 2020

MALAWI ROUTE-TO-MARKET ANALYSIS

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POWER AFRICA BRINGS PARTNERS TOGETHER WITH THE AIM OF HELPING 60 MILLION HOUSEHOLDS ACCESS POWER

POWER AFRICA
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Goal:

To enable electricity access by adding…

60 million
new electricity connections

30,000 megawatts
of new and cleaner power generation

Power Africa brings together technical and legal experts, the private sector, and governments from around the world to work in partnership to increase the number of people with access to power

126
Transactions financially closed

10,471
megawatts financially closed

THE SOUTHERN AFRICA ENERGY PROGRAM (SAEP) ADDRESSES CONSTRAINTS TO INVESTMENT IN THE ENERGY SECTOR

Program duration

March 2017 – March 2022

11 target nations

Components

Program components designed to address the **five key constraints to investment** in the Southern African energy sector include:

1. Improving Regulation, Planning, and Procurement for Energy
2. Improving Commercial Viability of Utilities
3. Improving Regional Harmonization and Cross-Border Trade
4. Demonstrating and Scaling Renewable Energy and Energy Efficient Technologies and Practices
5. Increasing Human and Institutional Capacity

MALAWI ROUTE-TO-MARKET ANALYSIS

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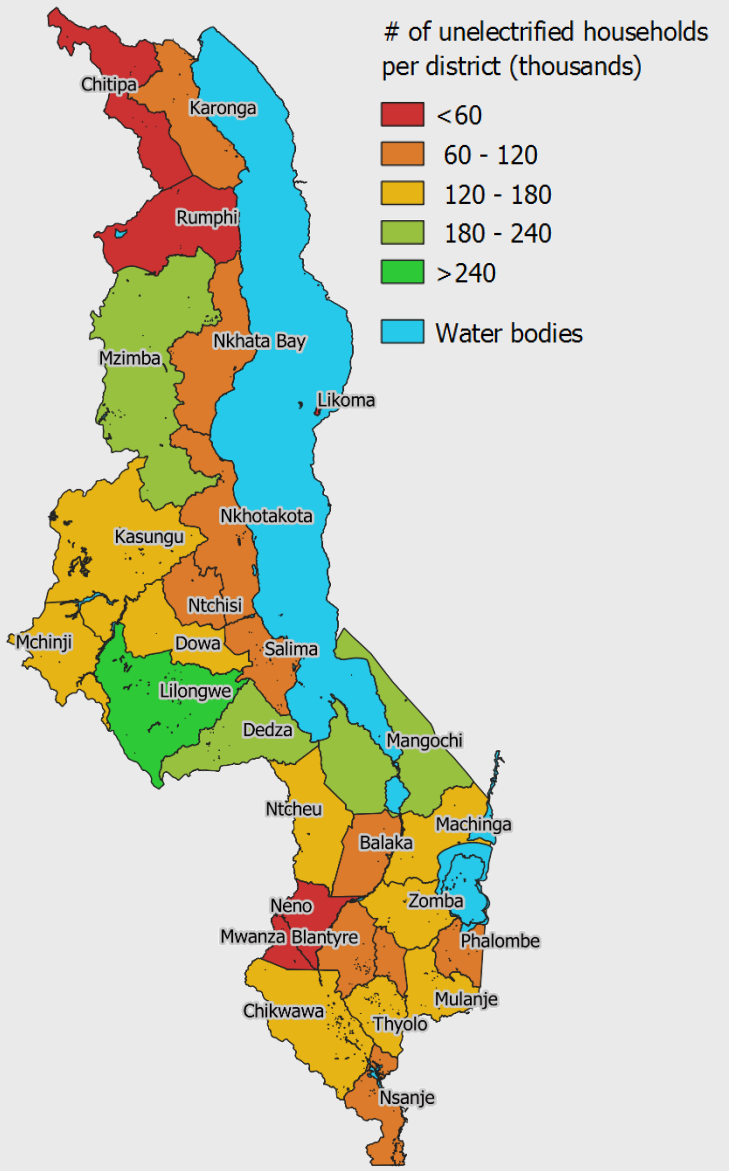
OVERVIEW OF ROUTE-TO-MARKET ANALYSIS

Context

- USAID SAEP has developed an initial **route-to-market (RTM) analysis that uses geospatial data and techniques to map population, density, electrification and** road **infrastructure** data
- This analysis aims to provide solar home system companies with the **ability to prioritize geographic markets with the highest potential for expansion or deeper market penetration**, and thereby develop robust RTM strategies



Benefits

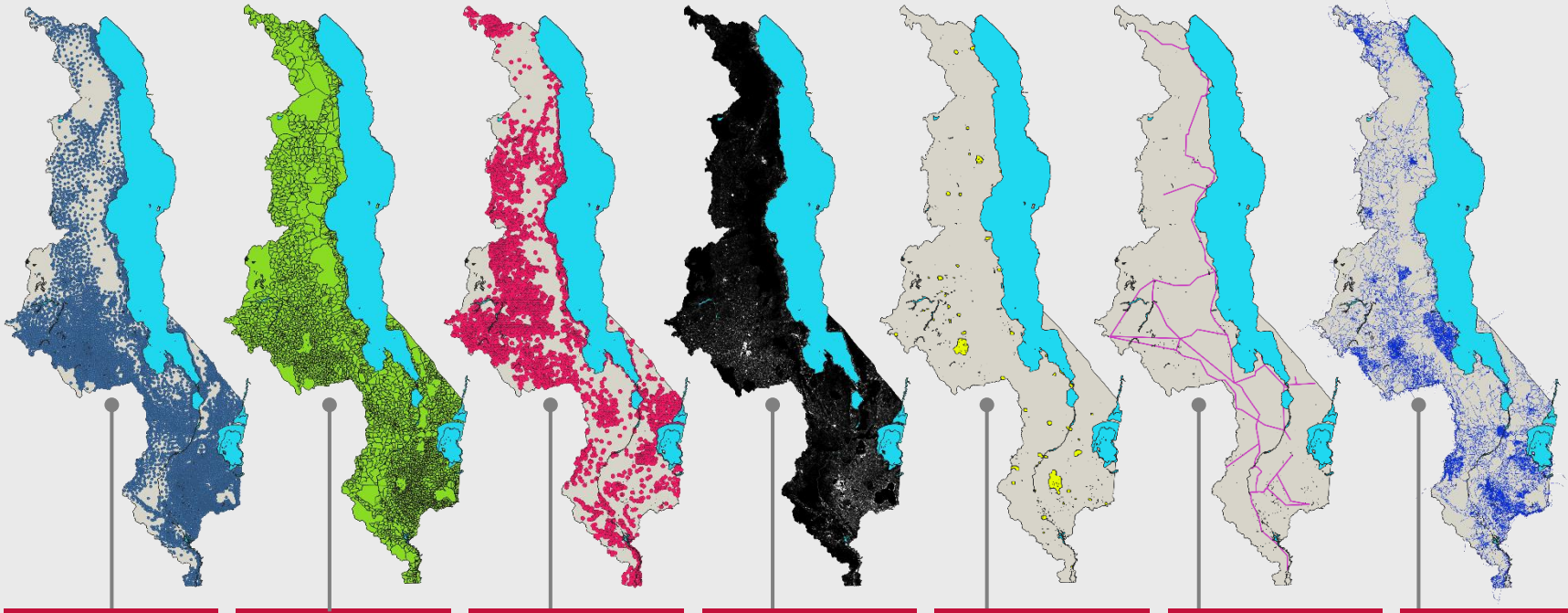
- ✓ Helps **identify high potential geographic markets** in Malawi for expansion
- ✓ Enables **customization of criteria** to identify **specific target markets**
- ✓ Supports the **development of robust RTM strategy**

THE ANALYSIS IS DEVELOPED USING PUBLICLY AVAILABLE DATASETS

Primary datasets to construct RTM analysis

Used to validate primary datasets

Input datasets



Populated places MASDAP[1] Villages – 2018

Adminis-trative areas Diva-GIS – 2018

Populated places GeoNames – 2018

Population density WorldPop – 2018

Night time lights VIIRS[2] Satellite imagery – 2013[3]

Transm-ission lines Energy Data – 2017

Road network Open Street Maps – 2018

1 MASDAP is a public platform for GIS Data that offers daily Malawi OpenStreetMap extracts
2 Visible Infrared Imaging Radiometer Suite (VIIRS) is a sensor that offers nighttime satellite imagery
3 Most recent dataset available

INPUT DATASETS ARE COMBINED AND SUMMARIZED IN A 3-STEP METHODOLOGY TO DEVELOP INSIGHTS

Methodology

1 Calculate total population and number of households

- Identify total number of geographies – Malawi has **3,124 level 3 administrative areas**
- Sum the **total population** from the WorldPop dataset
- Calculate area and **population density**
- Calculate the total **number of households**
- Key assumption used is 1 household = 5 people

2 Calculate electrification rates

- Utilize nightlight dataset to categorize **areas with electricity** and **areas without electricity** access
- For each geography, calculate the **percentage of population living in electrified areas**
- Calculate the **number of households in electrified and unelectrified areas**
- Validate the electrified areas using the **proximity to transmission lines** to **validate** the categorization[1]

3 Calculate driving time and distance to major cities

- In each geography, **identify the point** that is best to use to calculate the driving time and distance, to and from major cities
- The village with the **highest population density** within each geography chosen for the purpose of this analysis
- Use the Open Street Maps road network dataset and **assign a driving speed** to each **road type**
- **Calculate the driving time** and **distance** from major cities to the highest population density village in each geography

1 Ensured that settlements close to transmission lines were counted as areas with access and settlements far from transmission lines were counted as areas without access

Included in Jun 2019 update | Included in Oct 2019 update

IN TOTAL, 14 DATASETS ARE INCLUDED IN THE DATABASE

Data	Dataset(s)
1 **Unelectrified households,** #	▪ MASDAP villages (2018) ▪ Nighttime light emissions VIIRS (2013)
2 **Household density,** # HHS per km^2	▪ WorldPop (2018)
3 **Driving distance from Lilongwe, Blantyre, Mzuzu & Zomba** km	▪ Open Street Maps road network (2018)
4 **Households with some savings,** %	▪ 4th Integrated Household Survey (2016-17)
5 **Addressable market,** # HHS	▪ Multiplication of (1) and (4)
6 **Households owning mobile phones,** %	▪ 4th Integrated Household Survey (2016-17)
7 **Households using mobile money,** %	▪ Survey on Access and Usage of ICT services in Malawi (2014); adjusted for growth in access to 2018
8 **Majority Mobile Money provider,** provider name	▪ Survey on Access and Usage of ICT services in Malawi (2014)
9 **Households engaged in agricultural activity,** %	▪ 4th Integrated Household Survey (2016-17)
9a **Households engaged in rainy season agricultural activity,** %	▪ 4th Integrated Household Survey (2016-17)
9b **Households engaged in dry season agricultural activity,** %	▪ 4th Integrated Household Survey (2016-17)
10 **Number of secondary schools in admin level 3,** #	▪ USAID GIS data
11 **Number of health centres in admin level 3,** #	▪ USAID GIS data
12 **Number of key markets (trading centres) in admin level 3,** #	▪ WFP Malawi
13 **Number of primary schools in admin level 3,** #	▪ WFP Malawi
14 **Number of health centres in admin level 3,** # (35 additional health centres)	▪ WFP Malawi

KEY ASSUMPTIONS MADE AND LIMITATIONS OF THE RTM TOOL

	Topic	Description
Assumptions	▪ Population	▪ Population data used is **based on 2015 data** ▪ **Most recent data** available is from Malawi **population census (2018)** however this data is **at district level** and does **not have level of granularity** (administrative level 3) used in the RTM tool
	▪ Households	▪ It was assumed that **1 household is made of 5 people** ▪ Malawi population census (2018) states that **average household size is 4.4** and ranges between 4.3 to 4.8 across the three regions; USAID SAEP rounded up to 5 to capture the whole household
	▪ Electrified areas	▪ The **nightlight dataset** was used to **categorize areas** with **electricity** and areas **without electricity access** ▪ An electrified region that **does not produce constant light at night throughout the year** or whose light levels are **very low** might **not appear electrified**
	▪ Unelectrified households	▪ Unelectrified households account **only for households** in areas **without electricity access** as categorized using the nightlight dataset (in reality there might be **unelectrified households in electrified regions however this has not been captured**)
	▪ Addressable market	▪ Assumed that the **addressable market** in a geography is the **affordability** percentage **multiplied** by the **unelectrified households** ▪ **Affordability** percentage is assumed to be the **percentage of households whose income allows for at least some savings**
Limitations	▪ Data accuracy	▪ **Accuracy of the insights** derived from the tool is dependent on the **accuracy and relevance of the datasets** incorporated into the tool. For example: – Mobile money usage data was obtained from the Survey on Access and Usage of ICT services in Malawi conducted in 2014 – Nighttime lights data, obtained from VIIRS was last updated in 2013

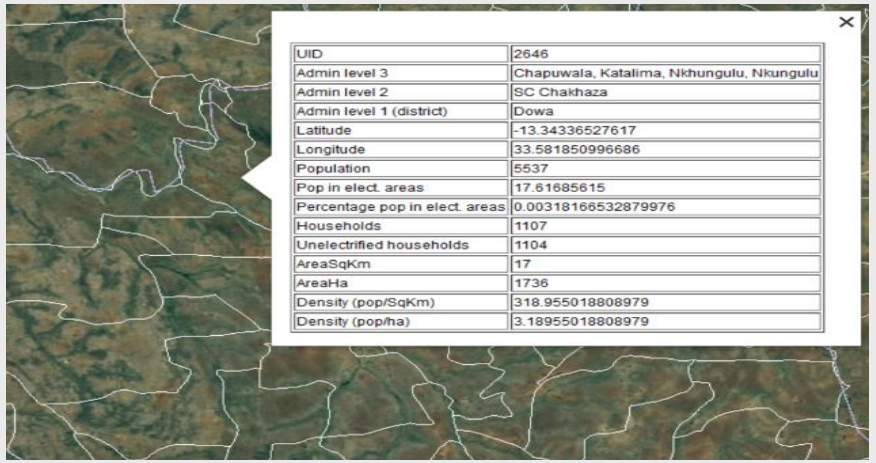
DATABASE OUTPUT IS IN MULTIPLE FORMS AND CAN BE CUSTOMIZED TO ADDRESS A COMPANY'S SPECIFIC NEEDS

Output examples

Excel file

UID	Admin level 3	Population	Pop in elect. areas
1	Chiwanga, James Silindu, J	7831	0
2	Chikombwi, Ichinga, Luwiti	8020	0
3	Mwandovi	4348	0
4	Chibweza, Dzama, Madzi,	5892	0
5	Chalonga (A), Kapuzama (A	4607	0
6	Bisa, Kumangulu, Mdzinja	6030	0
7	Chambo, Kalulu	11502	4059
8	Chimwaye, Chinkhowe, Ma	5735	0
9	Chiwete (B), Lemwe, Mafu	5499	0
10	Chigangawa, Chitedze, Wiz	7008	0
11	Chana, Chigwirizani Farm,	4150	0
12	Alemeka	5116	4682
13	Chikuta, Chipuliro, Kalima,	7154	0
14	Chankholombe, Kaphika, V	10905	0
15	Bakiele, Chilundu, Katibula	4528	0
16	Becond Farm, Gomani, Siti	7018	0

Google Earth KML files



Next steps

Let's look at the tools!

MALAWI ROUTE-TO-MARKET ANALYSIS

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USE CASE 1 – WHERE TO OPEN A NEW HUB?

Context

- An **SHS company based in Lilongwe** wants to find the **best place to open a small agent hub** and **hire sales agents**
- They want to **prioritize districts and cities** that have **high addressable market, high mobile access** and that are located relatively **close to Lilongwe**
- They also want to **go deeper** and identify the best **smaller areas**, the administrative level 3 areas

Approach

Results

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Approach

The company performed the following steps using the RTM tool:

- Applied the following **filters** on the sheet "Districts and main cities"
  - **Addressable market** (HHS) > 10,000
  - **Mobile phone ownership** (% HHS) > 40
  - **Road distance to Lilongwe** (km) < 250
- **5 districts** were filtered: Dowa, Kasungu, Nkhotakota, Balaka and Ntchisi
- **Filtered the administrative level 3 areas** of each of these 5 districts on the sheet "Admin level 3 geographies"
  - There are **507 resulting geographies**
- Applied the following filter: Addressable market (HHS) > 250
  - There are 47 resulting admin level 3 geographies, from which **33 are from Ntchisi**. This means **Ntchisi is a good candidate to put an agent hub**
- Went to **Google Earth and looked for the 33 locations** and chose the **best connected by road**

Results

- ✓ **Ntchisi district is a good place to open a new hub**
- ✓ **Chilooka or Mbobo both seem to be good locations for the new hub because of their connectivity**

USE CASE 2 – HOW BIG IS THE ADDRESSABLE MARKET?

Context

- An SHS company wants to **build hubs in the 4 main cities** of Malawi: Lilongwe, Blantyre, Mzuzu and Zomba
- They want to **cover the regions** that are located **maximum 2 hours' drive away**
- To **plan their staffing model and start recruitment** they want to estimate **how big the addressable market is**

Approach

Results

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- They want to **cover the regions** that are located **maximum 2 hours' drive away**
- To **plan their staffing model and start recruitment** they want to estimate **how big the addressable market is**

Approach

The company performed the following steps using the RTM tool:

- Created Excel **pivot tables for each city** with the driving time, area UID and the addressable market (HHS) columns from the sheet "Admin level 3 geographies"
- Filtered the areas with a **drive time of 2 hours or less**. The **resulting addressable market** in total is 194,349 households (Lilongwe: 52,778; Blantyre: 77,239; Mzuzu: 29,380; Zomba: 34,952)
- Made a **visual check of addressable market** around the cities on Google Earth using the ruler tools
  - Realized that there is probably an **overlap between Blantyre and Zomba**
- Went back to the excel and **created a 5th pivot table** where the first column combined the driving time of 2 hours or less both from Blantyre and Zomba – the total addressable market here represents the overlap, that is 23,007 that needs to be deducted
- **Total addressable market** is 171,341 households with the adjustment

Results

✓ **The addressable market is 171,341 households in the given regions**

USE CASE 3 – WHERE TO SEND THE AGENTS TO SELL?

Context

- A **location manager** in the Mzimba hub is looking at **new areas** where they should send the agents to
- The locations further away are quite **unknown**, they **don’t know the villages, the distance, the main centers** and convening points
- They want to **give clear directions to their agents** about the highest potential areas from the administrative level 3 geographies

Approach

Results

USE CASE 3 – WHERE TO SEND THE AGENTS TO SELL?

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- They want to **give clear directions to their agents** about the highest potential areas from the administrative level 3 geographies

Approach

The company performed the following steps using the RTM tool:

- Filtered admin level 3 areas in Mzimba district and **filtered the results from largest to smallest addressable market** (HHs), high **mobile money penetration** (>30%) and high **number of schools** to find the top 5 most promising areas
- Looked up the **top 5 areas** in **the Google Earth**: out of the 5, **two areas are far away** while **one was already targeted**, hence they **identified and marked two new areas with a pin on the map**
- Identified **main centers through the Google Earth image** marked them with a pin on the map
- **Drew up a path** to **check the distance** from Mzimba to the center with Google Earth ruler to **estimate resource need** of reaching the area

Results

- ✓ **2 new areas prioritized (Location ID 2366 and 1324)**
- ✓ **One village center identified at each new area with estimated distance from Mzimba**

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REFERENCES

List of publicly available data sources used in analysis

- **Diva-GIS:** Malawi administrative level-3 areas (2018) – http://www.diva-gis.org/gdata
- **Energy Data:** Transmission lines (2017) – https://energydata.info/dataset/africa-electricity-transmission-and-distribution-2017)
- **GeoNames:** populated places for Malawi (2018) – geonames.org
- **MASDAP:** Villages dataset (2018) – masdap.mw
- **NGDC:** VIIRS satellite imagery (2013) – https://ngdc.noaa.gov/eog/dmsp/downloadV4composites.html://ngdc.noaa.gov/eog
- **Open Street Maps:** Malawi road network (2018) – www.geofabrik.de
- **WorldPop:** Malawi 2020 population estimation (2018) – (http://www.worldpop.org.uk)

THANK YOU FOR WATCHING THE VIDEO

Please reach out to the below email addresses for further details and assistance with the RTM tool:

- **Arthur Wengawenga,** SAEP Malawi Country Manager – awengawenga@southernafricaenergy.org
- **Central contact** – malawi@southernafricaenergy.org
- **Link to the Excel file:** https://dec.usaid.gov/dec/content/Detail_Presto.aspx?vID=47&ctID=ODVhZjk4NWQtM2YyMi00YjRmLTkxNjktZTcxMjM2NDBmY2Uy&rID=NTU4NDc1
- **Link to the Google Earth file:** https://dec.usaid.gov/dec/content/Detail_Presto.aspx?vID=47&ctID=ODVhZjk4NWQtM2YyMi00YjRmLTkxNjktZTcxMjM2NDBmY2Uy&rID=NTU5Mjkw

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