SOUTHERN AFRICA ENERGY PROGRAM (SAEP)

MOZAMBIQUE ROUTE-TO-MARKET ANALYSIS: INTRODUCTION

Discussion document | May 2021

MOZAMBIQUE ROUTE-TO-MARKET (RTM) ANALYSIS

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OVERVIEW OF RTM ANALYSIS

Context

- USAID SAEP has developed a **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 (SHS) companies with the **ability to prioritize geographic markets with the highest potential for expansion or deeper market penetration**, and thereby develop robust RTM strategies
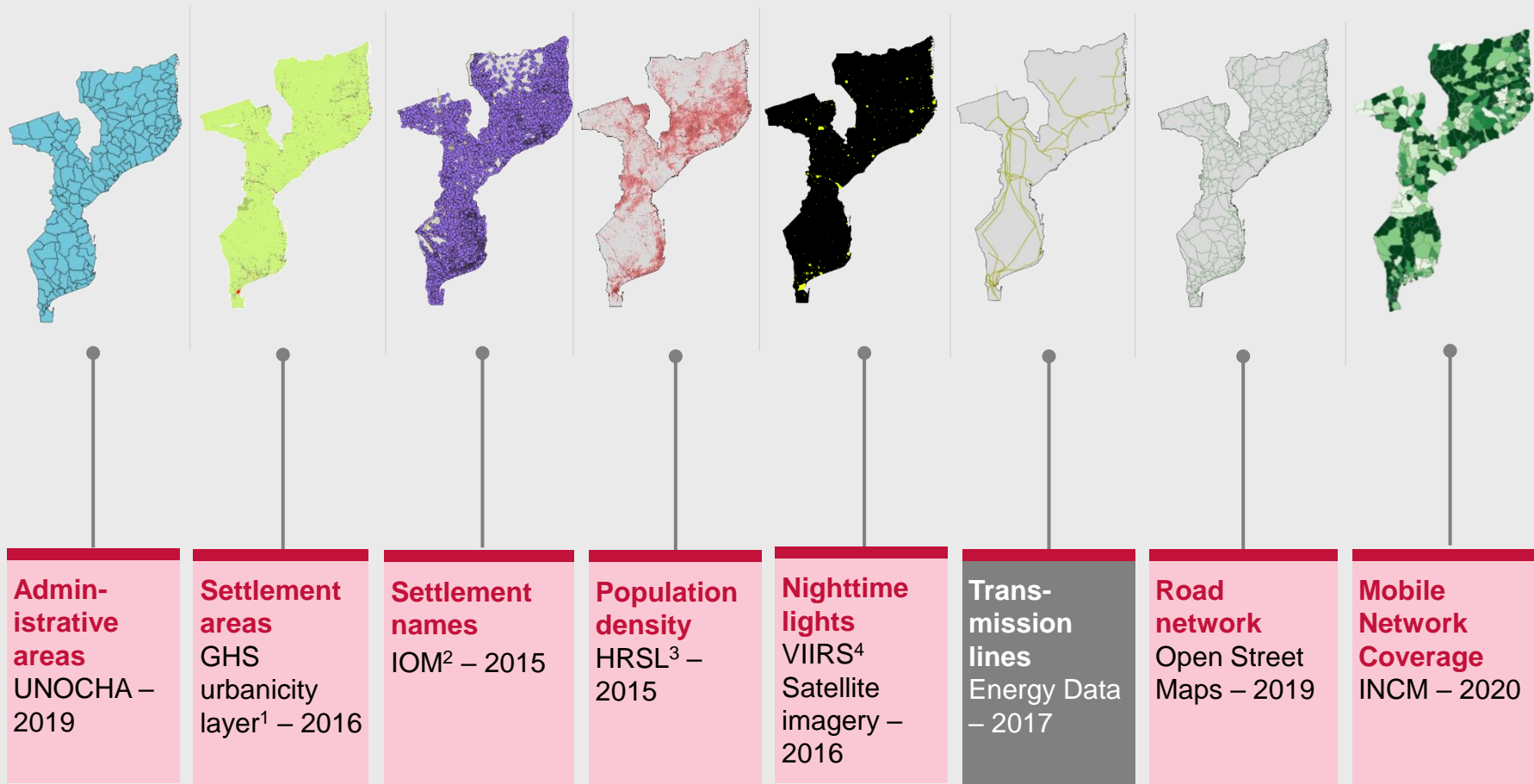

Addressable market (HHS)
- 0 - 1k
- 1k - 3k
- 3k - 5k
- 5k - 10k
- 10k - 30k
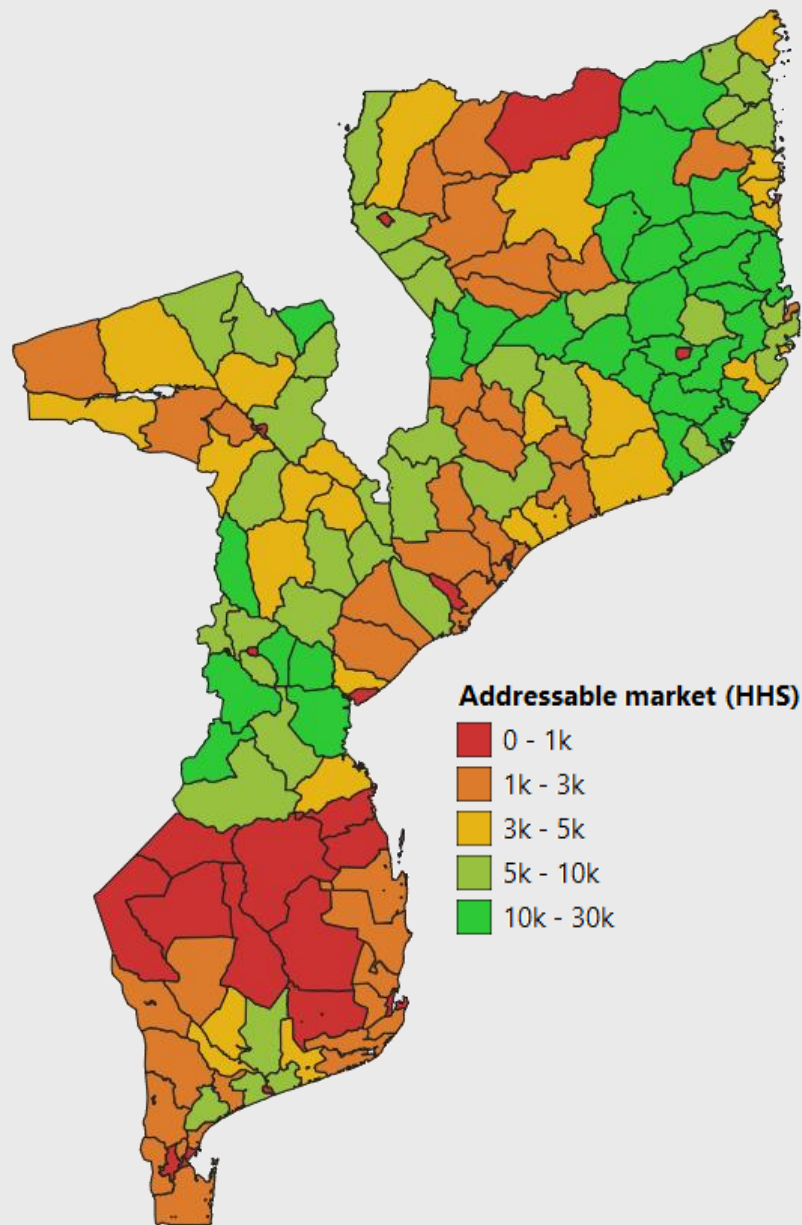
Benefits

- ✓ **Helps identify high potential geographic markets in Mozambique for expansio**n

- ✓ **Enables customization of criteria to identify specific target markets**

- ✓ **Supports the development of robust RTM strategies**

THE ANALYSIS IS DEVELOPED USING PUBLICLY AVAILABLE DATASETS

■ Primary datasets to construct RTM analysis

■ Used to validate primary datasets used

Input datasets

| Admin-istrative areas UNOCHA – 2019 | Settlement areas GHS urbanicity layer[1] – 2016 | Settlement names IOM[2] – 2015 | Population density HRSL[3] – 2015 | Nighttime lights VIIRS[4] Satellite imagery – 2016 | Trans-mission lines Energy Data – 2017 | Road network Open Street Maps – 2019 | Mobile Network Coverage INCM – 2020 |

1 Global Human Settlement urbanicity layer from European Commission
2 International Organization for Migration
3 High Resolution Settlement Layer
4 Most recent dataset available

INPUT DATASETS ARE COMBINED AND SUMMARIZED IN A 4-STEP METHODOLOGY TO DEVELOP INSIGHTS

4 Quantify the number of Points of Interest (POIs)

3 Calculate distance to major cities

2 Identify unelectrified areas

1 Identify settlements and determine settlement size

Identify settlements and determine settlement size	Identify unelectrified areas	Calculate distance to major cities	Quantify the number of Points of Interest (POIs)
Determine all **urban areas** of Mozambique and distinguish them **from sparsely populated areas**	Disaggregate areas **with and without access to the grid***	Calculate **road distance between each settlement and the closest of the 12 largest cities and towns** (the team defined the 12 largest cities as those with a dense city center of >100,000 people[3])	Calculate the number of **schools and health centers** within each settlement and the low population density areas of each "posto" administrative area
Group geographic areas into **discrete settlement areas if they are of the same urbanicity category**[2], within the **same administrative area** (at the posto level) and are **continuous**	Calibrate the **threshold for light radiance** (which indicates presence of grid electricity) to ensure electrification rate of tool is aligned with rate cited by SolarPower Europe (28%), allowing for delineation between electrified and unelectrified areas		
Quantify **total population, density and number of households**[4] within each settlement and remaining rural areas of each posto	Calculate the **percentage of households in each settlement and rural area with and without electricity access**		

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
2 Urbanicity defines the degree to which a given geographical area is urban
3 Exception to this is Vilankulo, which has a population <100,000, but was included as it is the largest settlement/town/city in Inhambane province
4 Key assumption is that 1 household has 5 people
SOURCE: SAEP geospatial model documentation

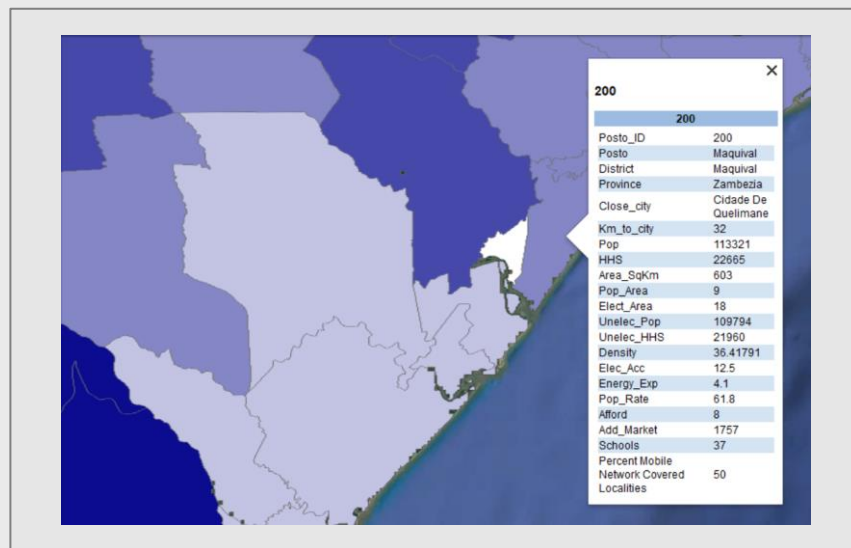# DATABASE OUTPUT IS IN MULTIPLE FORMS AND CAN BE CUSTOMIZED TO ADDRESS A COMPANY'S SPECIFIC NEEDS

Output examples

Detail to follow

Excel file

Settlement ID	Posto	District	Province	Pop	Households	Electrified area (SqKm)	Electrified area %
3460 Maxixe	Maxixe	Inhambane	1,971	394	1	50
3764 Messica	Manica	Manica	415	83	1	50
3845 Milange	Milange	Zambezia	281	56	1	50
5404 Nhamayabue	Mutarara	Tete	4,261	852	2	50
706 Chidzolomondo	Macanga	Tete	1,757	351	1	49
753 Chinde	Chinde	Zambezia	3,096	619	1	49
1769 Gorongosa	Gorongosa	Sofala	2,486	497	1	49
3569 Mecufi	Mecufi	Cabo Delgado	1,343	269	1	49
5169 Nangade	Nangade	Cabo Delgado	6,963	1,393	2	49
5760 Pessene	Moamba	Maputo	31	6	1	49
6030 Sussundenga	Sussundenga	Manica	9,913	1,983	3	49
6038 Sussundenga	Sussundenga	Manica	96	19	0	49
639 Chicumbane	Limpopo	Gaza	16,924	3,385	5	48
4248 Mphende	Magoe	Tete	1,239	248	0	47
5433 Nicoadala	Nicoadala	Zambezia	2,687	537	1	47
735 Chimbonila	Chimbonila	Niassa	2,522	504	1	46
1953 Inhaminga	Cheringoma	Sofala	1,589	318	1	46
3165 Marromeu	Marromeu	Sofala	164	33	1	46
4710 Nacala-A-Velha	Nacala-A-Velha	Nampula	10	2	0	46
4969 Namapa	Erati	Nampula	6,037	1,207	3	46
5082 Namina	Mecuburi	Nampula	1,443	289	1	46
5239 Netia	Monapo	Nampula	52	10	1	46
5616 Palma	Palma	Cabo Delgado	10,304	2,061	3	46
5881 Ribaue	Ribaue	Nampula	7,112	1,422	3	46

Google Earth KML files

200	
Posto_ID	200
Posto	Maquival
District	Maquival
Province	Zambezia
Close_city	Cidade De Quelimane
Km_to_city	32
Pop	113321
HHS	22665
Area_SqKm	603
Pop_Area	9
Elect_Area	18
Unelec_Pop	109794
Unelec_HHS	21960
Density	36.41791
Elec_Acc	12.5
Energy_Exp	4.1
Pop_Rate	61.8
Afford	8
Add_Market	1757
Schools	37
Percent Mobile Network Covered	50
Localities	

Next steps

The analysis can be **customized by each SHS and industry player** to focus on the drivers of market attractiveness that are important to them

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EXCEL FILE OUTPUT EXAMPLE

1 **Calculated total population and number of households**

2 **Calculated electrification rates**

Posto	District	Province	Pop	Households	Area (SqKm)	Pop density (pop per SqKm)	Household density (HHS per SqKm)	Populated area (SqKm)	Pop density in populated area (pop per SqKm)	Household density in populated area (HHS per SqKm)	Electrified area (SqKm)	Electrified area (%)	Unelectrified pop	Unelectrified households
Siete de Abril	Meconta	Nampula	9354	1871	12	803	161	2	5769.147138	1153.952779	1	7	6121	1224
Siete de Abril	Meconta	Nampula	605	121	6	104	21	0	5675.931925	1135.186385	0	0	605	121
Siete de Abril	Meconta	Nampula	374	75	4	92	19	0	2928.29918	587.2257714	0	0	374	75
Siete de Abril	Meconta	Nampula	10	2	0	181	36	0	2490.906505	498.1813009	0	0	10	2
Siete de Abril	Meconta	Nampula	154	31	4	37	8	0	5690.462314	1145.482674	0	0	154	31
Siete de Abril	Meconta	Nampula	164	33	6	28	6	0	5417.665558	1090.140021	0	0	164	33
Alto Changane	Chibuto	Gaza	58	12	6	10	2	0	3229.100571	668.0897733	0	0	58	12
Alto Changane	Chibuto	Gaza	109	22	3	33	7	0	3147.476942	635.2705755	0	0	109	22
Alto Changane	Chibuto	Gaza	55	11	6	10	2	0	3163.211622	632.6423245	0	0	55	11
Alto Changane	Chibuto	Gaza	69	14	6	12	3	0	3175.285413	644.2608085	0	0	69	14
Alto Changane	Chibuto	Gaza	610	122	23	27	5	0	3167.455858	633.4911717	0	0	610	122
Alto Changane	Chibuto	Gaza	176	35	6	32	6	0	3166.70538	629.7425471	0	0	176	35
Alto Changane	Chibuto	Gaza	148	30	6	27	5	0	3212.314252	651.1447807	0	0	148	30
Alto Changane	Chibuto	Gaza	58	12	5	11	2	0	3180.945812	658.1267197	0	0	58	12
Alto Changane	Chibuto	Gaza	124	25	4	28	6	0	3194.436996	644.0397169	0	0	124	25
Alto Changane	Chibuto	Gaza	135	27	3	41	8	0	2931.455783	586.2911567	0	0	135	27
Alto Changane	Chibuto	Gaza	165	33	6	30	6	0	3244.221037	648.8442073	0	0	165	33
Alto Changane	Chibuto	Gaza	459	92	8	60	12	0	3229.705639	647.3484069	0	0	459	92
Alto Changane	Chibuto	Gaza	107	21	5	22	4	0	3159.449704	620.0789139	0	0	107	21
Alto Changane	Chibuto	Gaza	476	95	11	43	9	0	3189.494855	636.5588472	0	0	476	95
Alto Changane	Chibuto	Gaza	27	5	5	5	1	0	3111.352301	576.1763521	0	0	27	5
Alto Changane	Chibuto	Gaza	1320	264	4	300	60	0	3128.201376	625.6402751	0	0	1320	264
Alto Changane	Chibuto	Gaza	49	10	3	15	3	0	3233.272137	659.8514565	0	0	49	10
Alto Changane	Chibuto	Gaza	278	56	4	63	13	0	3181.588363	640.8954976	0	11	278	56
Alto Changane	Chibuto	Gaza	159	32	4	36	7	0	3207.261456	645.4865823	0	0	159	32
Alto Changane	Chibuto	Gaza	418	84	14	29	6	0	3298.654358	662.8874786	0	0	418	84
Alto Changane	Chibuto	Gaza	338	68	8	42	9	0	3167.543184	637.2572085	0	0	338	68
Alto Changane	Chibuto	Gaza	41	8	4	9	2	0	3261.266247	636.3446335	0	0	41	8
Alto Changane	Chibuto	Gaza	280	56	6	51	10	0	3152.959199	630.5918399	0	0	280	56
Alto Changane	Chibuto	Gaza	96	19	6	17	3	0	2958.047185	585.4468386	0	0	96	19
Alto Changane	Chibuto	Gaza	151	30	4	34	7	0	3145.937	625.0205961	0	0	151	30

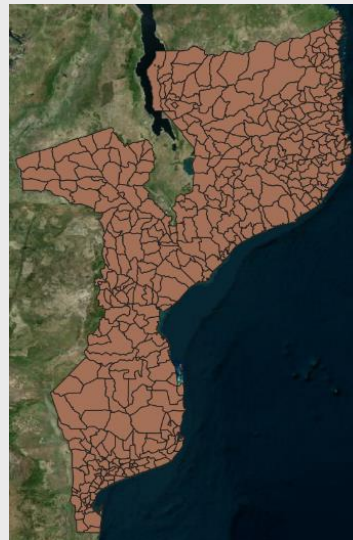# USERS CAN IDENTIFY MARKETS IN THE TOOL AT VARIOUS LEVELS OF GRANULARITY
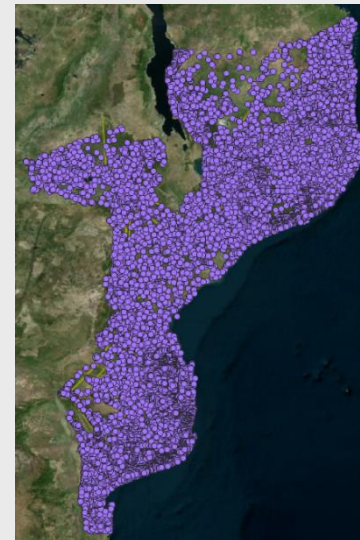
Geographical granularity
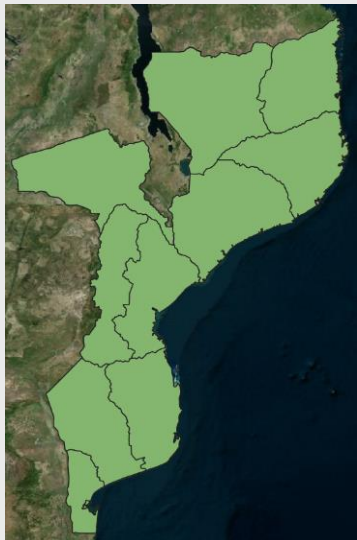
Provinces (11), e.g., Inhambane, Cabo Delgado
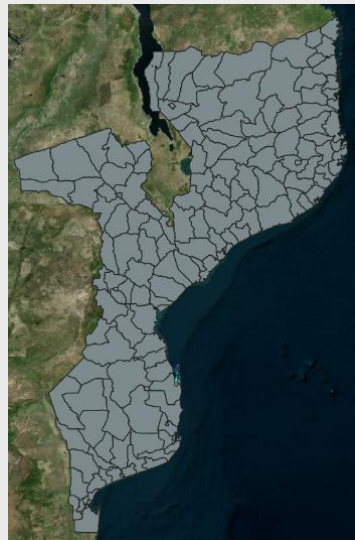
Districts (159), e.g., Matutuine, Buzi, Boane

Postos (411), e.g., Bazua, Calipo

Settlements (7,815)[1]

1 USAID SAEP is assigning settlement names

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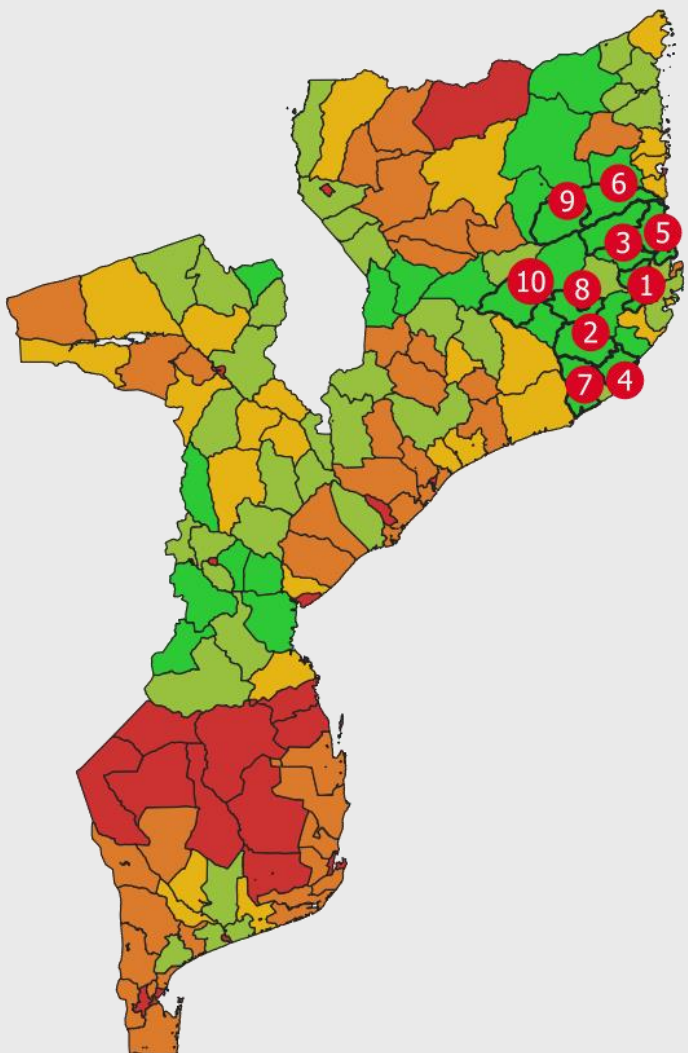
Overview and approach

Example analysis

References

THE DISTRICTS WITH THE LARGEST OPPORTUNITY ARE MONAPO, MOGOVOLAS AND ERATI

Largest potential district markets

	District	Addressable market, thousands
1	Monapo	29
2	Mogovolas	29
3	Erati	24
4	Angoche	24
5	Memba	23
6	Chiure	23
7	Moma	23
8	Rapale	22
9	Namuno	21
10	Ribaue	19

WITHIN THESE 3 DISTRICTS THE TOP 3 POSTOS ARE NETIA, MONAPO AND NAMAPA

Largest potential posto markets in top 3 districts
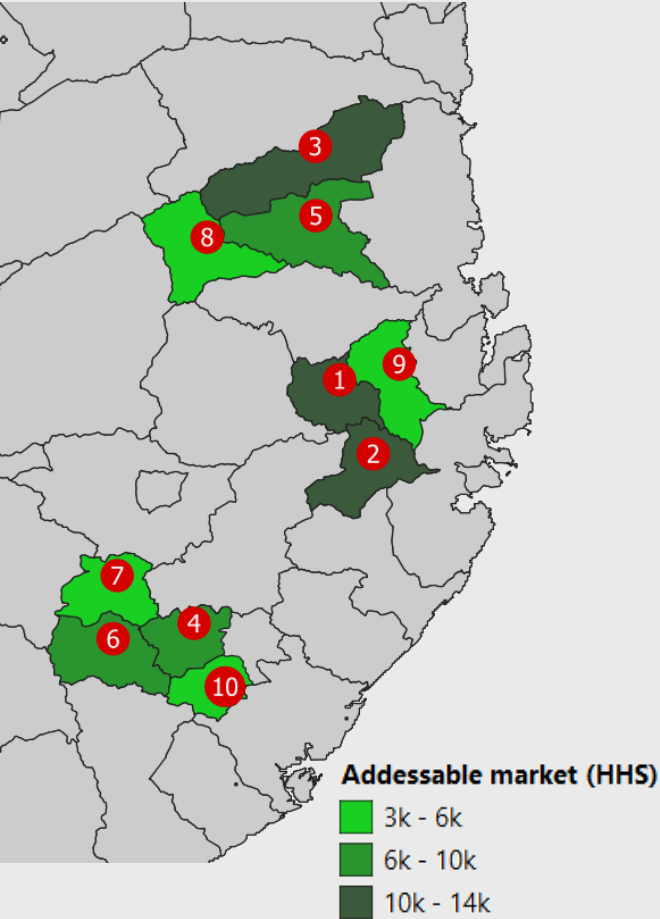
	Posto	District	Add. Market HHS, thousands
1	Netia	Monapo	13
2	Monapo	Monapo	11
3	Namapa	Erati	10
4	Nametil	Mogovolas	9
5	Alua	Erati	8
6	Iuluti	Mogovolas	6
7	Calipo	Mogovolas	6
8	Namiroa	Erati	5
9	Itoculo	Monapo	5
10	Nanhupo Rio	Mogovolas	4

Addessable market (HHS)
- 3k - 6k
- 6k - 10k
- 10k - 14k

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LIST OF DATA SOURCES INCLUDED IN THE RTM TOOL

Data layer:	Data source:	Description:	Link:
Population	HRSL[1] population data set, Columbia University	Population density at 30x30 meter resolution	https://www.ciesin.columbia.edu/data/hrsl/
Settlements	GHS urbanicity layer[2]	Settlement areas at 1kmx1km resolution, with a urbanicity classification	https://ghsl.jrc.ec.europa.eu/download.php?ds=smod
Roads	OpenStreetMap data	All roads in Mozambique by type (i.e. primary, secondary, etc.)	https://data.humdata.org/dataset/hotosm_moz_roads
Night time light emission	VIIRS[3] data set, NASA	Nightlights satellite image in grayscale intensities	https://earthobservatory.nasa.gov/features/NightLights/page3.php
Transmission line data	Energydata.info[4]	High voltage electrical transmission lines	https://energydata.info/dataset/mozambique-electricity-transmission-network-2017
Points of interest	WFP (World Food Programme)	Schools and health centers	
Mobile Network Coverage	Instituto Nacional des Comunicacoes de Mozambique (INCM)	Cellular coverage for the major telecom providers in the country	

1 High Resolution Settlement Layer
2 Global Human Settlement urbanicity layer from European Commission
3 Visible Infrared Imaging Radiometer Suite
4 Potential other sources: World Bank Geo map of transmission network (2017) - may be layered on OpenStreetMap and African Energy
  map (2016) - charge back of $100 (just a hardcopy map)