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THE IMPACT OF SURVEYING AND MAPPING IN TRANSFORMING GHANA'S ENERGY SECTOR; A CASE STUDY OF ELECTRICITY COMPANY OF GHANA(ECG) ASSET MAPPING PROJECT



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Objectives

ESSENTIAL BASEMAP



Map is for national projects

6

ILLEGAL CONNECTION

1

Identification of illegally
connected customers



DECISION SUPPORT



Useful other national projects

5

REVENUE

Increase revenue generation



2

GEODATABASE



Essential for analysis

4

NAVIGATION MAP

Support ECG field operations



3

Presentation offers a brief about electricity asset mapping, Shares on 6 key benefits of project and Draws conclusions for future projects.

Methodology



Capturing of field data for all ECG assets including meters, poles, pylons, transformers, customers' locations using Navcom LandPak GPS



Data editing and attribute data standardization using ArcGIS, google earth and excel sheets



Automating categorization of map features into AutoCAD using LSM Escript application

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basemap

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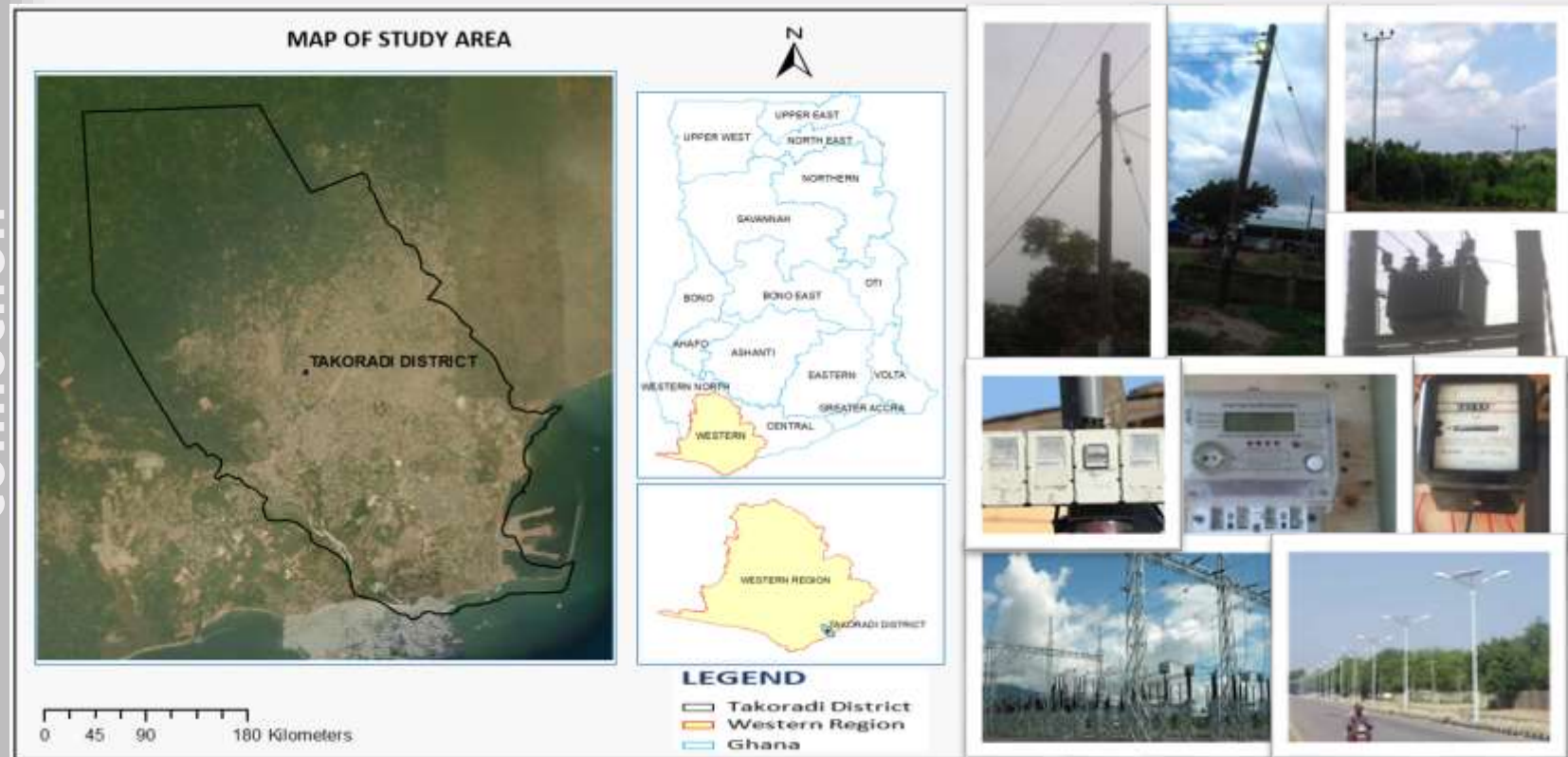
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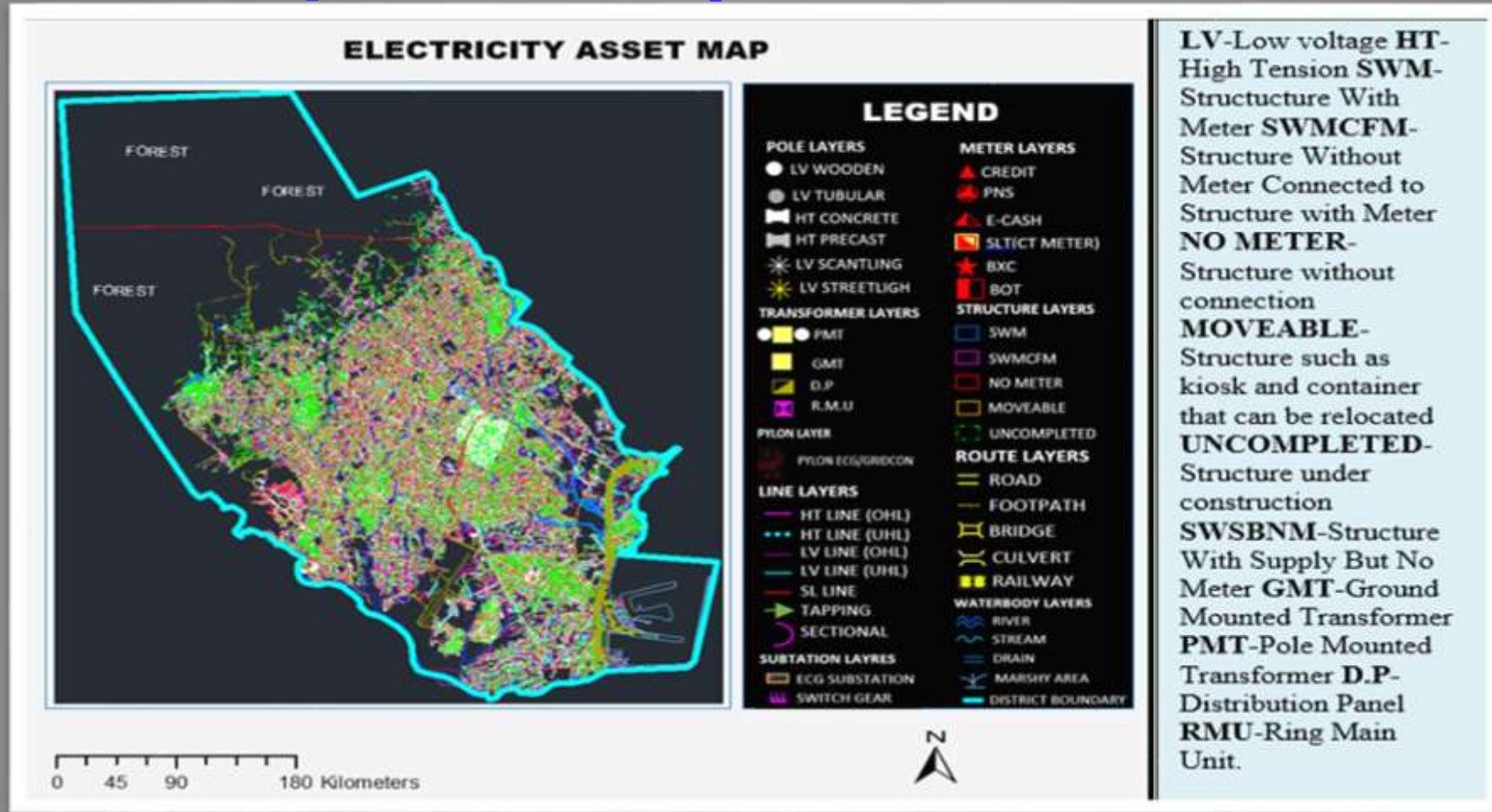
Study Area



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- A spatial geodatabase of all electricity assets (meters, poles, pylons, transformers, substations, distribution panels) and clients' information (location, meter types, tariff types and activity code of building).

Electricity Asset Map For Takoradi District

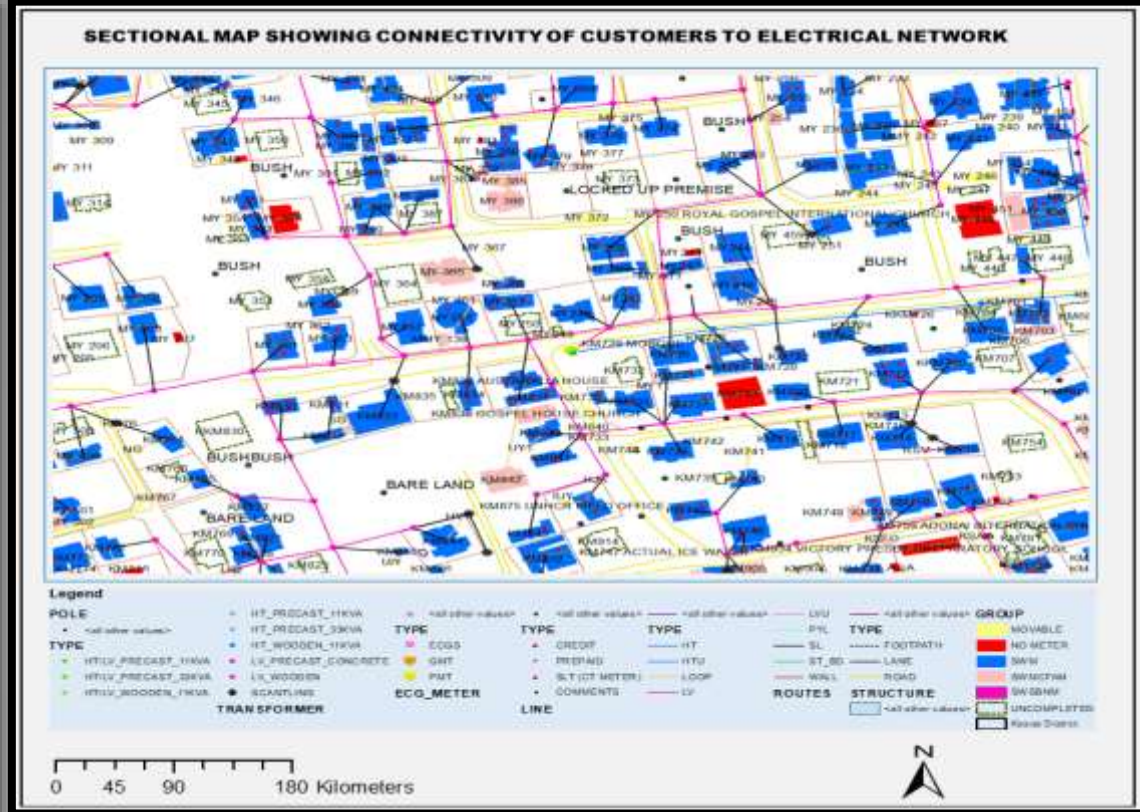
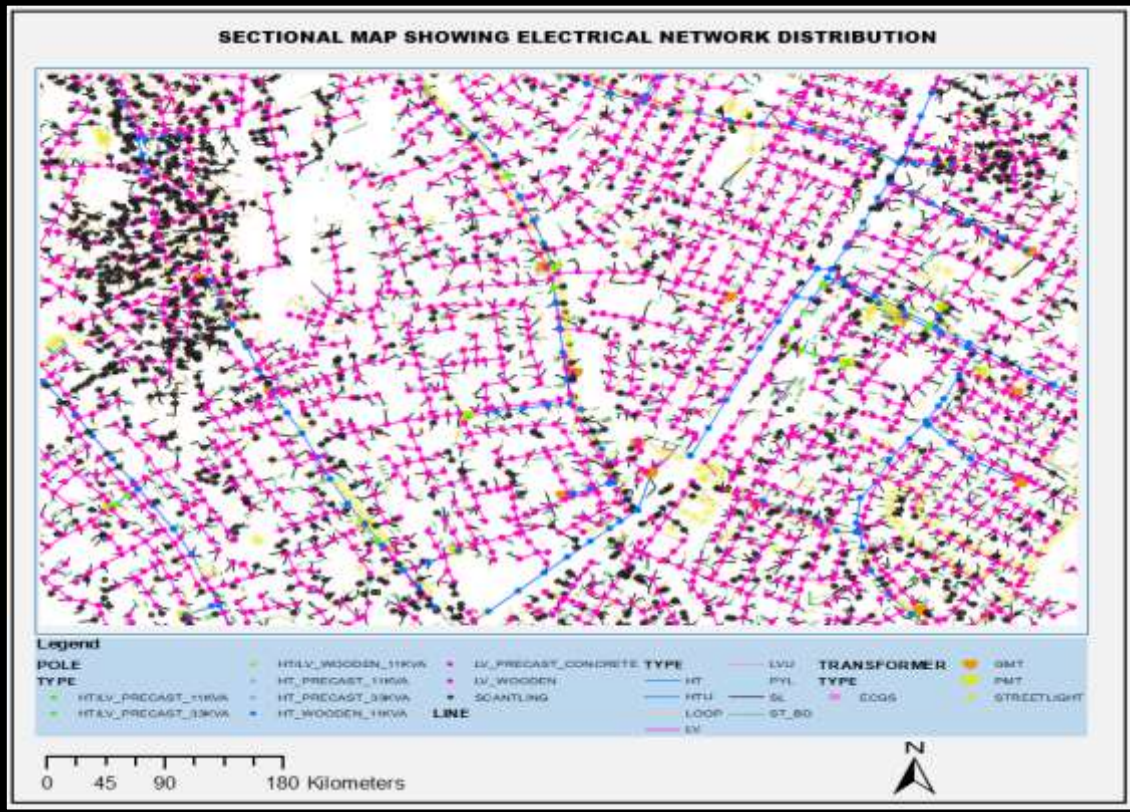


LV-Low voltage HT-High Tension SWM-Structure With Meter SWMCFM-Structure Without Meter Connected to Structure with Meter **NO METER**-Structure without connection **MOVEABLE**-Structure such as kiosk and container that can be relocated **UNCOMPLETED**-Structure under construction **SWSBNM**-Structure With Supply But No Meter **GMT**-Ground Mounted Transformer **PMT**-Pole Mounted Transformer **D.P**-Distribution Panel **RMU**-Ring Main Unit.

about project

The result also indicated a total of 83,199 Structures (buildings) and 77,125 meters in the district. Out of the total number of structures in the study area, 36.7% representing 30,525 had a meter and 15.7% representing 13,088 had no meter but tapped from structures with a meter, 0.6% representing 469 had no meters but had a direct supply from the network (illegal connectors) and 47.0% representing 39,117 were unconnected to ECG's electrical network.

Map Of Electrical Network & Customer Connectivity



about project

Electrical network is made up of LV, HT, and Scantling poles; LV, HT, Pylon, and Tapping lines; Pylons, Transformers, Primary substation, Distribution panels, Ring Main Units, and Streetlights. The LV and HT lines are 11KVA and 33KVA conductors whilst the pylon lines are 161KVA and 330KVA conductors.

Location of customers and their connection to the electrical network and demonstrates the navigational property of the map with road features and landmarks.

Identification Of illegal Connections



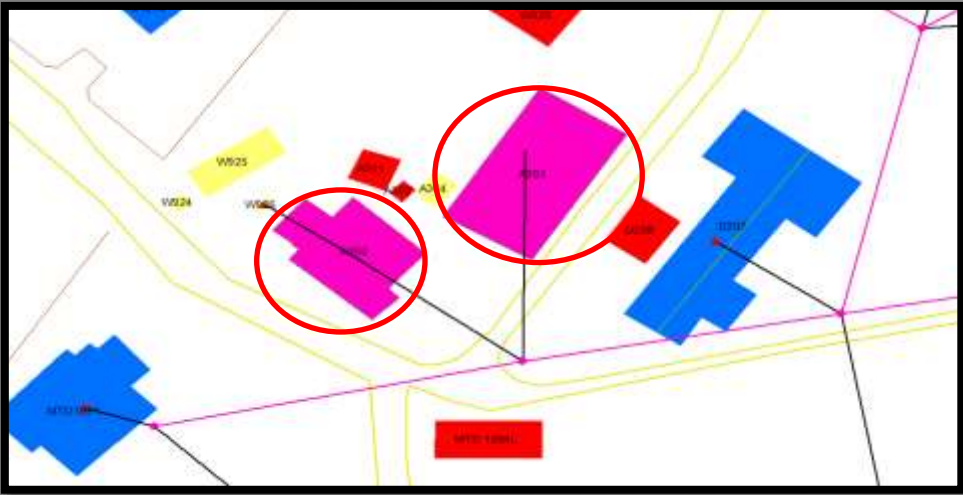
The screenshot shows a news article from the website 'GRAPHIC ONLINE'. The article title is 'Illegal connections: ECG earns GH¢4.8 million from penalty'. The date is 'Aug 23, 2013, 02:56' and the author is 'BY: Samuel K. Obour'. The article text states: 'The Electricity Company of Ghana (ECG) raked in GH¢4.8 million as penalty from 1,136 people who were caught engaging in illegal electricity connection in the first half of this year.' The ECG logo is visible in the article. The website header includes navigation links for Home, Ghana news Headlines, Business, Showbiz +, GraphicSports, World, Features, Juniors, Lifestyle, Editorials, and a secondary menu for GENERAL NEWS, POLITICS, EDUCATION, and HEALTH.



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- ❑ Identification of illegal connections through the ECG Asset mapping is helps ECG to recover millions of Cedis
- ❑ Ghana loses GH¢ 1.3 billion (US\$1.5 million) annually to illegal connection according African Centre for Energy Policy in 2021



Indicates that structures with IdsA303 and A300 have direct service line supply from the network but have no meter which denotes an illegal connection.



All buildings that are connected to Service Lines without meter are highlighted as **RED structures** (customers) on map for illegal connection.

In 2015, map identified a community, Chinto of over 200 households connected to ECG grid illegally and the report helped ECG to rectify-ONE OF SEVERAL CASES OF PROJECT FINDINGS

illegal connection

Revenue Generation

- ❑ The map data accurately records commercial and residential tariff properties which helps ECG to avoid losses especially where commercial properties use residential tariff
- ❑ ECG bills distributors have had difficulties locating clients(credit customers) due to incessant transfer of meters from one place to another. The map helps ECG track them and bill them.
- ❑ Ghana experienced electricity supply challenges costing the nation an average of US \$2.1 million in loss of production daily due to inability to pay power generators, pay employees and contractors.
- ❑ Averting illegal connections saves money and helps in recovering financial losses after prosecuting and fining culprits



Commercial facilities



Residential facilities



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Navigational Map for ECG Field Operations



2019 SECTIONAL MAP OF TAKORADI(APOWA) SHOWING ECG NETWORK, ROUTE NETWORKS, WATER BODIES(SEA BOUNDARIES, RIVERS, LAKES), AND BUIDINGS

- ❑ Navigation map with community names and land mark features aid location of ECG assets and customers.
- ❑ Field engineers and technicians rely on map for installation of new equipment, disconnection operations, repairs and maintenance tasks

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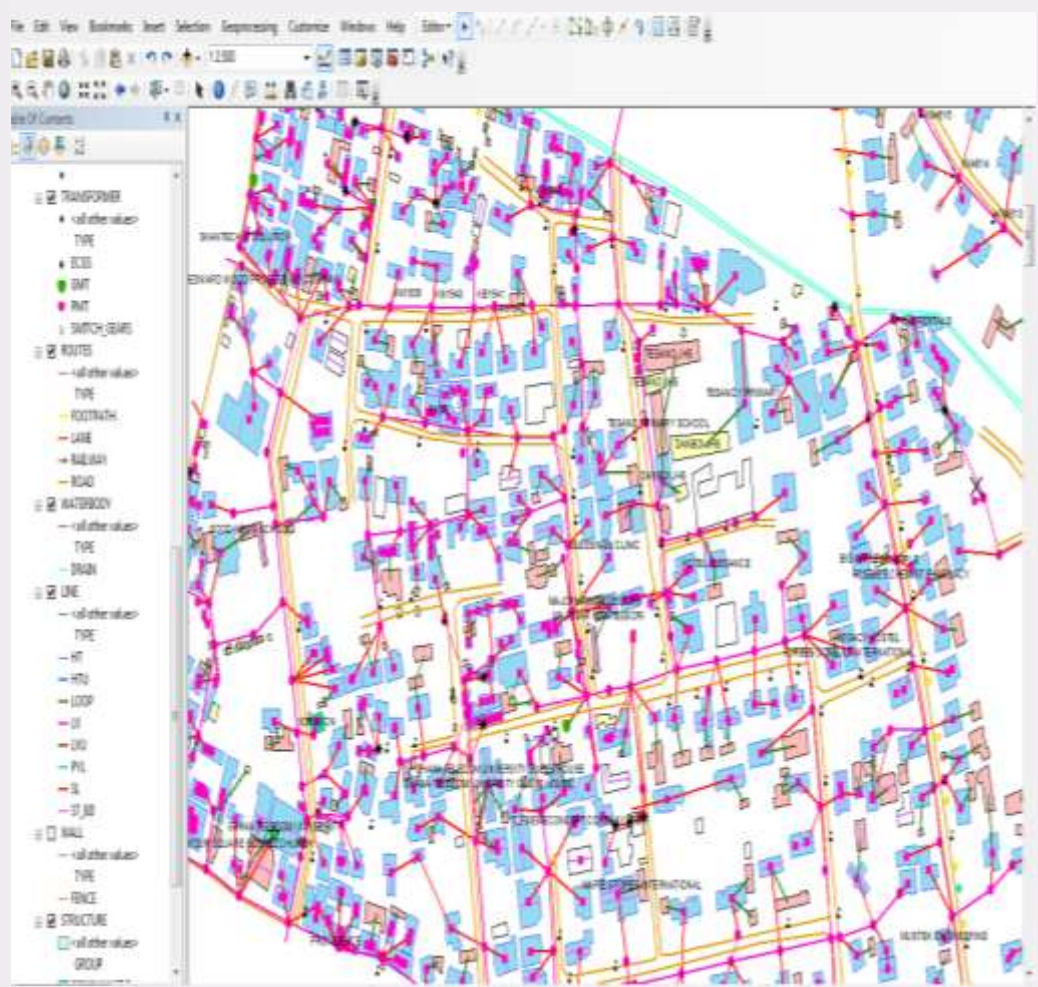
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Geodatabase For Queries & Analysis

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METERS		STRUCTURES	
Type	Count	GROUP	Count
Prepaid	76,607	SWM	30,525
Credit	399	Moveables	21,550
SLT(CT Meter)	119	SWMCFM	13,088
		No Meter	10,118
		Uncompleted	7,449
		SWSBNM	469
Total	77,125	Total	83,199

POLES	
Type	Count
HT/LV	196
HT	1,269
LV	13,205
Scantling	7,829
Total	22,499

TRANSFORMER	
Type	Count
PMT	75
GMT	191
Total	266

LINES	
Type	Length/ m
HT	75,531
LV	521,723
SL	705,681
Tapping	18,969
Pylon	25,460
Total	1,347,364

SUBSTATION	
Type	Count
Primary Substation	1
ECGS	1
Total	2

STREETLIGHTS	
Type	Count
Mono	2,980
Bio	369
Trio	5
Quad	6
Total	3,360

PYLONS	
Type	Count
Pylon	165
Total	165

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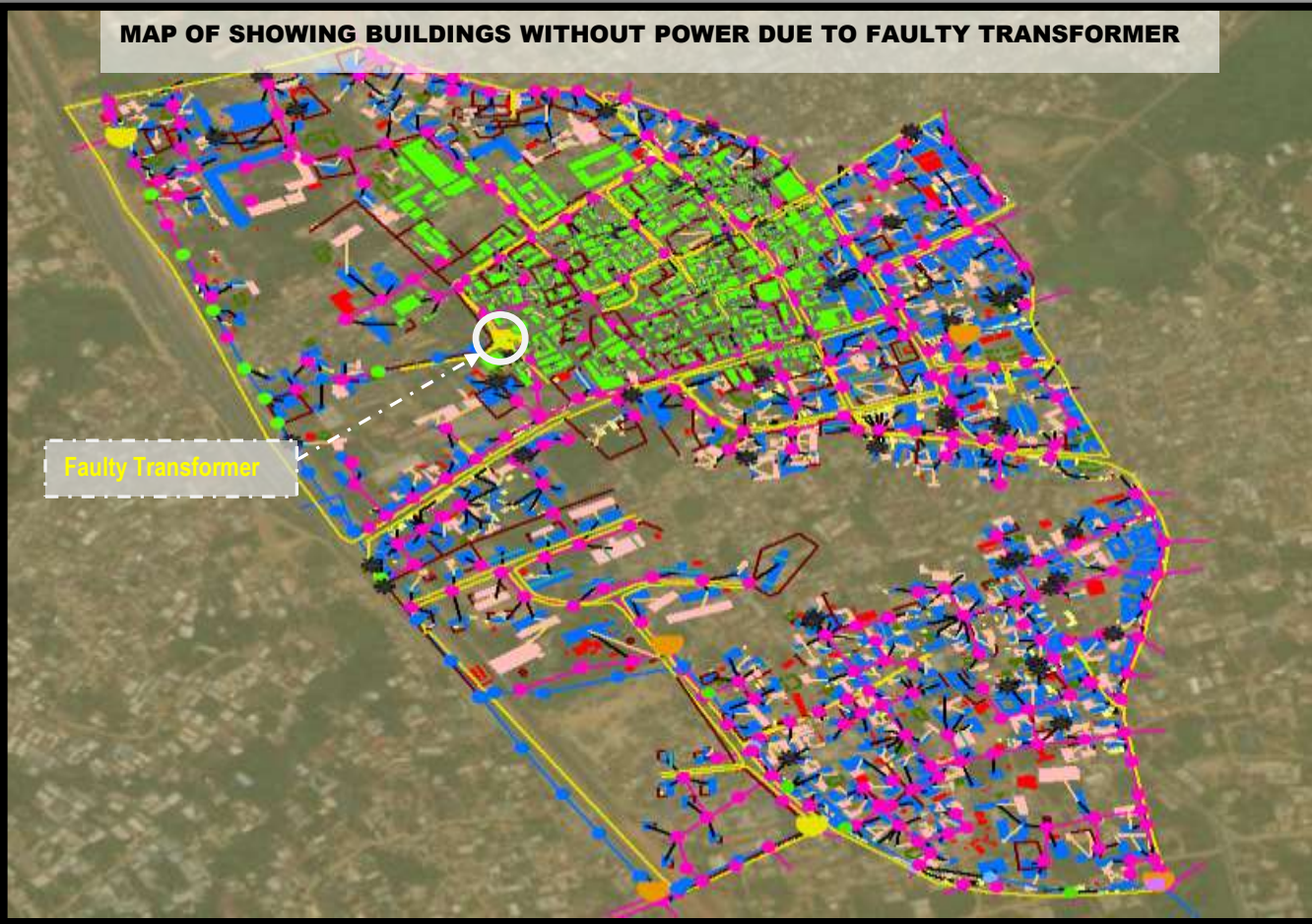
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MAP OF SHOWING BUILDINGS WITHOUT POWER DUE TO FAULTY TRANSFORMER



Faulty Transformer

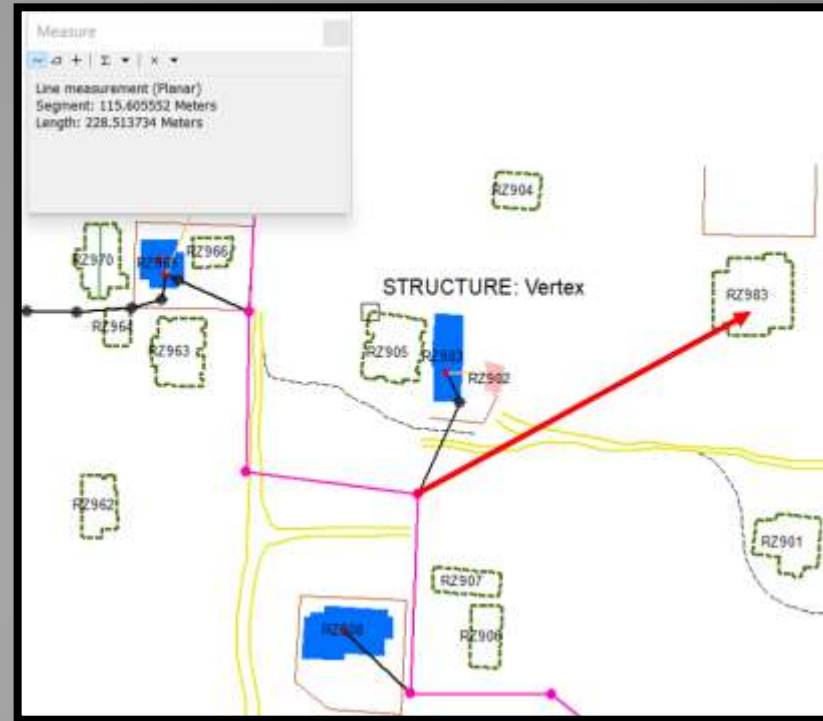
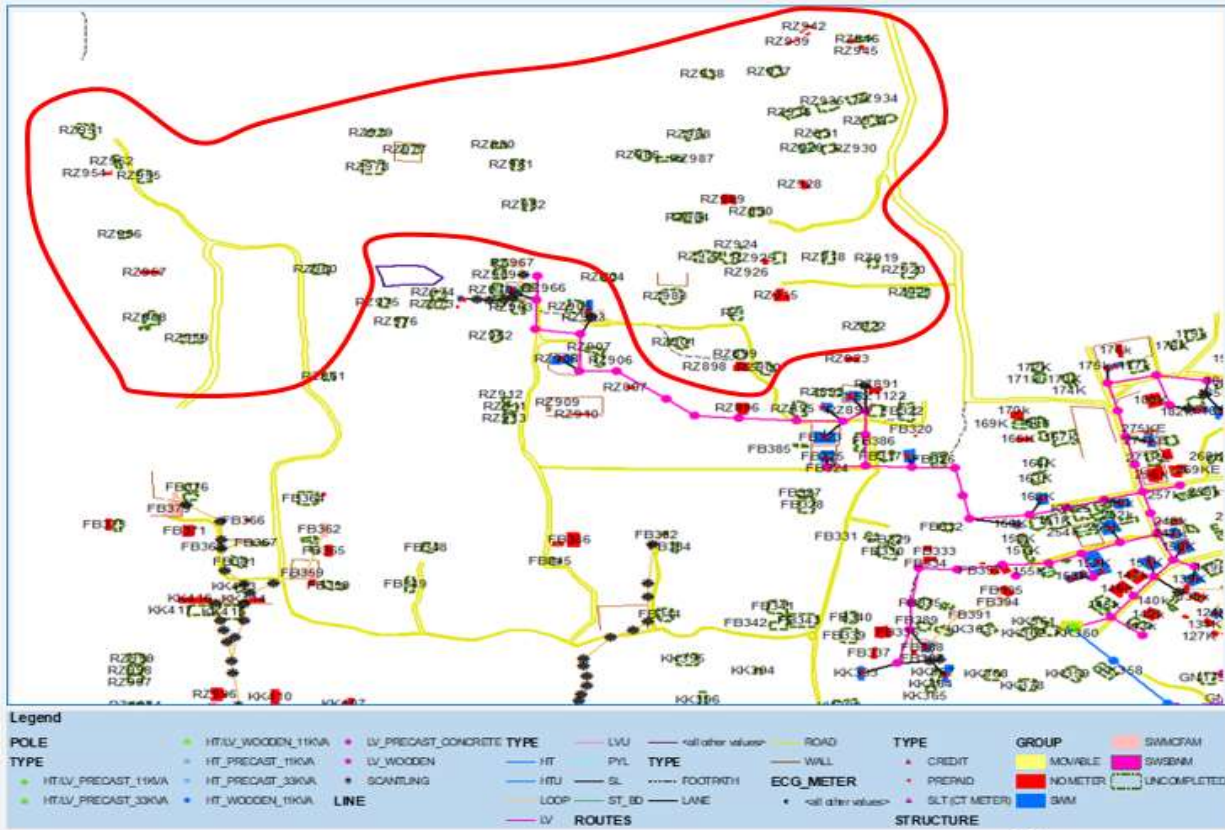
There is a total of **2,709 buildings** Within the Round with **6 transformers**
 A total of **372 buildings** are connected to faulty transformer.

POLE	LINE	TRANSFORMER	STRUCTURE
● HT/LV_PRECAST_11KVA	— HT	■ ECGS	■ MOVABLE
● HT/LV_PRECAST_33KVA	— HTU	● GMT	■ NO METER
● HT/LV_WOODEN_11KVA	— LOOP	● PMT	■ SWM
● HT_PRECAST_11KVA	— LV		■ SWMCFAM
● HT_PRECAST_33KVA	— LVU		■ SWSBNM
● HT_WOODEN_11KVA	— PVL		■ FAULTY TRANSFORMER AFFECTED BUILDINGS
● LV_PRECAST_CONCRETE	— SL		
● LV_WOODEN	— WALL		
✱ SCANTLING			
		ROUTE	
		— FOOTPATH	
		— LANE	
		— ROAD	

□ Demonstrates the usefulness of the map to determine customers affected when a transformer is out of service



SECTIONAL MAP SHOWING UNELECTRIFIED COMMUNITY



geodatabase

An unelectrified community with the dominance of uncompleted houses. This is suggestive of the development of a new community that would need electricity. This knowledge is essential for ECG to extend its network within an unelectrified community, increase the customer base and ultimately make additional revenue.

Demonstrates the usefulness of the map to compute a precise estimation of resources like several poles and the length of electrical cables needed for connecting a new client or an unelectrified community to the electrical network. For example to connect R2983 to the network the closest pole is 228.5m away. This avoids the overestimation of resources by field engineers and makes planning easy.

DSS and Service Performance Enhancement

- ❑ Helps ECG to determine unelectrified communities and extend network.
- ❑ Assists management to plan for procuring of ECG resources when prospecting needs now and tomorrow
- ❑ Illegal detections helps management to resolve the problems of overloading of transformers and Lines, poor electricity supply to the premises, damage to electrical equipment and risk of fire outbreak
- ❑ Improved revenue collection helps ECG to pay power generators, suppliers, staff, extend their network distribution and maintain their assets

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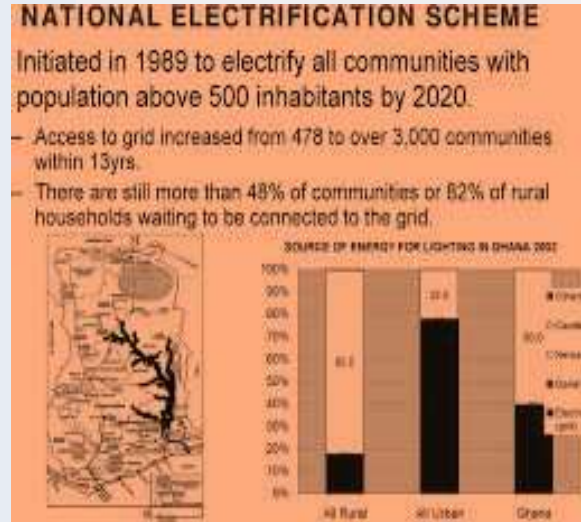
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Essential Basemap For ECG'S Related Projects & Other National Projects

- ❑ The National Electrification Scheme, NES is one of the key national project that relies on information of ECG's geospatial electrical network for determining unelectrified communities
- ❑ National Utility companies like Ghana Water, Ghana Police and Security Services, Ghana Fire Service, and Ghana Water Company have need for such detailed geospatial database
- ❑ An update with water meter layer is useful for water bills distribution, connection and disconnection operations.
- ❑ Ghana Fire Service needs such a map for route planning for shortest possible distance when there is fire out break. Also the map can be a great guide to direct them to fire outbreak area
- ❑ The Ghana police service needs such a map for crime mapping and planning for location of police stations and check points



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Conclusion



An electrical asset map provides an easy, fast, and reliable platform for retrieving information, planning field operations, optimizing opportunities for revenue generation, and improving power supply service to consumers



A remarkable advantage of a digital electrical asset map is that it offers a smarter alternative to the analog system of managing electrical assets data and customer information. The obvious trade-off is that digital maps are effective for error detection and correction, suitable for numerical and non-numerical information processing, and quick means for information retrieval and analysis.



The effectiveness of an electrical asset map like any geodatabase management system relies heavily on data accuracy, completeness, and consistency. It requires a quality control system at every stage during the data process including the method of spatial data collection, software for data editing, and expertise of the technical data management team. .





— Thank You! —



Thank You

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