



Creating the GIS based Electrical Asset Mapping and Consumer Indexing of Gudiyattam Town, Tamilnadu

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Reference Number: 6-12-17-990

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Abstract

Geographic Information System solution consists of capturing, storing, checking, integrating, manipulating, analyzing and displaying Geo-data related to positions on the Earth's surface and data related to attributes of the entities/Customers in a utility. This is achieved through GIS mapping to pre-defined scale, generation of intelligence electrical network maps and super imposing them on the land base GIS maps. Customer Indexing is defined here as a unique coding of index process for all types of Customers into a data base structure, created with pre determined attributes connected to a uniquely coded electrical network including locations with a facility using GIS tools to query and retrieve information. The project describes about database generation pertaining to electrical network mapping and consumer indexing using remotely sensed imagery and on GIS platform. Study area is Gudiyattam Town in Vellore district, one of the State in India, extending 8 sq.km. This project involves the generation of various GIS thematic layers like HT Network (11 KV feeder), LT network, HT_LT_poles, Distribution Transformers and Sub Stations in Gudiyattam Town, using DGPS, Systematic Door to Door survey of consumer details and integration of the data and overlaying on remotely sensed satellite imagery. The present work gives the better understanding of the Electrical Utility Networking and usage of GIS tool for improvement of electrical power distribution and quality service to the consumers.

Key words: DGPS, Electrical Utility Networking, consumer indexing.

1. Introduction

Geographical Information System for Transmission and Distribution Electrical Networks. This is achieved through GIS mapping to pre-defined scale, generation of intelligence electrical network maps and super imposing them on the land base GIS maps. Customer

Indexing is defined here as a unique coding of index process for all types of Customers into a data base structure, created with pre determined attributes connected to a uniquely coded electrical network including locations with a facility using GIS tools to query and retrieve information. Customer Indexing is defined here as a unique coding of index process for all types of Customers into a data base structure, created with pre determined attributes connected to a uniquely coded electrical network including locations with a facility using GIS tools to query and retrieve information. The Customer indexing and Asset management system is essential for gearing of Electric Distribution utilities to maintain the system in a dynamic mode to meet the day-to-day imperative changes

Creating the GIS based Asset Mapping and Consumer Indexing of Gudiyattam Town

- Online Digitization of Transmission and Distribution networks with a digitizer.
- Import and Display of Raster images and satellite imagery.
- Import of GPS data and creation of network topology.
- Geo-Referencing of Vector/Raster images.
- Consumer indexing.

Study area:

It is to cover urban areas - towns and cities with population of more than 30,000. In addition, in certain high-load density rural areas with significant loads, works of separation of agricultural feeders from domestic and industrial ones, and of High Voltage Distribution System (11kv).

Area of Interest:

Gudiyatham town has own limits of Electricity Board. The town has 7 ,11KV feeders serving the total Electcity Board limits. The feeders are Town, Telecom, Seruvangi, Sedukkarai, Santhapet, Pudupet and Nellorepet.

For this project only **Seruvangi 11 KV** feeder is been taken

2.Data and Material

For the present study, two types of database has been generated, viz. spatial database and attribute database.

For generation of spatial database, the remotely sensed images from Cartosat 2A have been utilized. The specification of the satellite and Sensor are: CARTOSAT – 2A is the thirteenth satellite in the Indian Remote Sensing Satellite series (IRS). It is a sophisticated and rugged remote sensing satellite that can provide scene specific spot imagery. This satellite carries a Panchromatic Camera (PAN). The spatial resolution of this camera is better than 1m and swath of 9.6 km. Imageries from this satellite are used for cartographic applications like mapping, urban and rural infrastructure development and management, as well as application in Land Information (LIS) and Geographical Information System.

For extraction and generation of GPS points and layout generation of electrical network was carried out using Trimble junio ,Trimble GeoXT, Trimble R3 model having a specification of 0.5meter accuracy, standalone time 120 seconds.

Single Line diagrams (SLD) from TANGEDCO.

Attribute database consisting of HT Line, LT Line, HT Pole, LT Pole, distribution Transmission.

Attribute consumer

1. Account No. (Service No.), 2.Name of the Service - Name of the person or name of the company 3. Address 4. Owned/Leased 5. Tariff code – Given6. Feeder Id. 7. Voltage level8.Sanctioned Demand.9. Connected Load(KW) 10. Metering Set Details:a)Make b)seril no c) Metering Set Installation Date d) Metering Set

Multiplication e) Type of Connection: Over Head /Under Ground f) Current in Amperes g) Voltage h) Meter Location inside / outside i) Meter Type/model j) No of digits in the meter k) Phase l) Physical Status l l.Remark

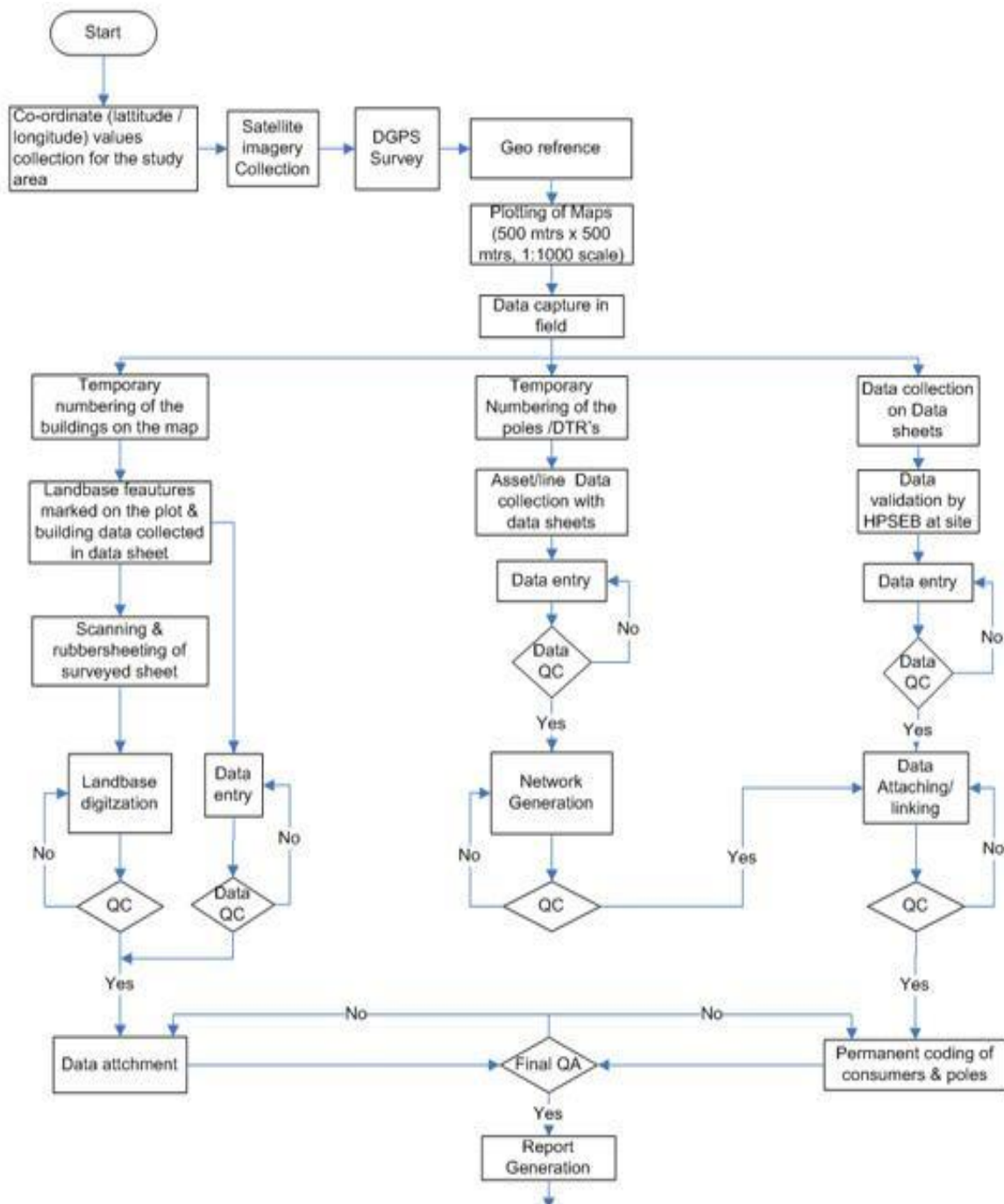
Hardware and software :

GPS: Trimble junio ,trimble Geoxt, tremble R3

Software : EARDAS 9.1, Arc Gis 9.3 Trimble

3. Research Methodology

Work flow chart



Methodology is four parts

Part A)

Generation of Maps

A Satellite data procement from NRSC of Cartosat 2A.

In this project for creation of land base creation better visibility of roads , buildings and other feature.It required high resolution imagery for proper consumer indexing location, pole location and electrical utility

Geo-referencing

GIS tools used for geo-referencing is **ERDAS Imagine 9.1** can transform image.

One can geo-reference a set of points, lines, polygons, images, or 3D structures. For instance, a GPS device will record latitude and longitude coordinates for a given point of interest, effectively geo-referencing this point. A geo-reference must be a unique identifier. In other words, there must be only one location for which a geo-reference acts as the reference.

Eardas (earth resource data analysis system)9.1 imagine software used for georeferencing



GCP 004



collection of GCP 004

Part B)

Asset network generation

Asset mapping refers to all assets up to the pole in the distribution network from a substation Asset Mapping is of two types: Substation assets and Network assets

Substation Assets:

These are the assets of TANGEDCO starting from pylon, feeder line, power transformer, current transformer, lightning arrestor, bus bar meter etc that are available within the substation boundaries.

Network Assets:

These are the assets of TANGEDCO starting from the outlet of substation, feeder wise thru HT poles- Distribution Transformer – LT Pole.

In case of Underground Cables, the network starts from SS, DT, RMU/RMG, Feeder Pillar, Service Pillar and House connection service point.

In the network, the various structures and assets like Distribution structure, Isolators / switches and the structures holding the same etc also need to be collected.

Asset Numbering:

For all assets, unique temporary number has to be given and the same has to be written on the asset. The numbering schema and the codes are given below, separately.

Survey:

The location of all HT / LT assets should be surveyed with DGPS process. The base station for GCP has to be used. The co-ordinates of the Base station can be collected. the primary base point / GCP's used for geo-referencing.

The Differentially processed data for all assets need to be submitted, along with the raw data. Each point should have the unique number as marked in the field.

The processed GPS data of assets need to be superimposed on to the satellite data to confirm its positional accuracy with respect to the nearby features like building/compound walls, junctions or any other visible permanent structure. In case, if the differentially processed GPS do not correspond to the actual location, the same need to be marked on the satellite images at its appropriate place- for submission.

The location of these structures can be marked on the base map / satellite data. For the Underground HT network, the department is in possession of the drawings/datasets. The same need to be verified and corrected to its accurate geographic position in the ground. For underground network of service connection from the service/feeder pillar, the end point of meter / house connection should be given a unique number.

Efforts can be made to collect the same and scan, Georef – digitization of the same for easy and effective navigation in the field. This would be very effective in the areas of Underground Cable network

Part C)

Consumer Indexing in survey:

In this project, the major tough task is to survey the consumers and indexing. Satellite images are little bit old and finding the buildings is difficult to surveyors and also central areas, where there is no gap between buildings. In project **Seruvangi 11 KV** feeder was taken

CONSUMER SURVEY- Indexing



Legend

- HT_LT_Poles
- ⊠ Distribution_Transformer
- LT_Consumers
- LT_Line
- Service_Line

gudiyattam_rectified.tif
RGB

- Red: Band_1
- Green: Band_2
- Blue: Band_3

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Consumer Indexing in Survey

Consumer survey data collected by door to door survey .the collected data from consumer is

- 1.Account No. (ServiceNo.),
- 2.Name of the Service - Name of the person or name of the company
3. Address
4. Owned/Leased
5. Tariff code – Given
6. Feeder Id.
7. Voltage level
8. Sanctioned Demand.
9. Connected Load(KW)
10. Metering Set Details:
 - a)Make
 - b)seril no
 - c) Metering Set Installation Date
 - d) Metering Set Multiplication
 - e) Type of Connection: Over Head /Under Ground
 - f) Current in Amperes
 - g) Voltage
 - h) Meter Location inside / outside
 - i) Meter Type/model
 - j) No of digits in the meter
 - k) Phase
 - l)

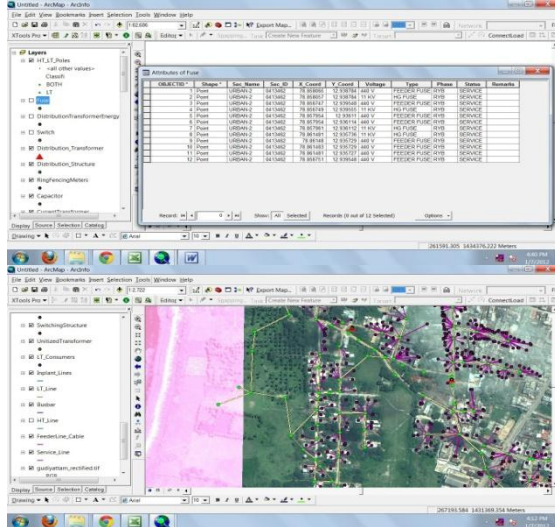
Physical Status

11. Remark Consumer survey data in excel format. this excel data was attached as attributes to consumer information in Arc Gis 9.3

Part D)

Overly obtain gps point on imagery

Collection of DGPS point of HT pole LT pole and DTR over lay on obtain imagery.



Attribute of HT/ LT/DTR

Overly of Dgps point

4. Results and Analysis

The results obtained from the project have assisted in the following areas;

Length of **seruvangi 11 kv** feeder is 40 kilometer.

Consumer are about is 8000

Ring fencing: Another issue is electrical ring fencing by the utility, i.e. demarcating the electrical boundaries of individual HT (11 KV) feeders. This requires installation of boundary meters on HT feeders to help determine feeder-wise electricity flow. Unless ring-fencing is done by the utility, it is very difficult for to define the boundaries for GIS-based network mapping and energy accounting.

Conclusions

Technology is application for meter reading, billing and collection; energy accounting and auditing; MIS (management information system); redressal of consumer grievances, establishment of Information Technology enabled consumer service centers etc.

- (i) Reducing Aggregate Technical and Commercial (AT&C) losses;
- (ii) Improving quality of supply of power;
- (iii) Increasing revenue collection; and
- (iv) Improving consumer satisfaction

Acknowledgements

I express my sincere thanks to our **Srinivas Gudelli** Managing Principal, Naksha Consulting Group, Hyderabad for his technical guidance and suggestions which helped me a lot in completing this project.

I also express my sincere thanks to all the faculty members of the center for environment, IST JNTUH who helped me with their valuable suggestion and encouraged me to complete this project successful. I ponder for words to explain the help and support rendered by my Family Members and all friends without whose encouragement and support I would not have been able to complete this work.

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