Synopsis of the thesis entitled

DESIGNING AND DEVELOPMENT OF WEB BASED MANDAL
INFORMATION SYSTEM USING GEOMATICS- A CASE STUDY FROM
PRAKASAM DISTRICT, A.P., INDIA

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1.0 INTRODUCTION

As per the recent notification of Ministry of Environment and Forests (MoEF), Government of India, dated 14 September 2006, Environmental Clearance is needed to establish any type of developmental projects like, mining of minerals, oil and gas exploration, thermal power plants, nuclear power, coal washeries, metallurgical, cement plants, petroleum refining, coke oven plants, asbestos milling, townships, construction, chlor-alkali, soda ash, leather, fertilizers, pesticides, petro-chemical complexes, distilleries, sugar, oil & gas pipeline, hazardous chemicals, air ports, all ship breaking yards, Export Processing Zones (EPZs), Special Economic Zones (SEZ’s) biotech parks, Transport Storage Disposal Facilities (TSDFs), CETPs and common municipal solid waste management. In order to get the Environmental clearance (EC), Environmental Impact Assessment (EIA) and Environmental Management plan have to be submitted to the concerned authorities. In preparing the EIA report, the baseline data of the project site is to be collected through many ways. The baseline data consists of topography, utilities, basic terrain information, settlements, land use / Land cover and its associate features, water bodies, drainage patterns, road & transport information etc., Acquisition of this data needs too much time and is involved huge money. Therefore, it is more appropriate to have the digital database of the terrain with all the parameters mentioned
above. To manage, store, retrieve and disseminate such digital data products, an information system is necessary.

Hence an attempt is made to create the digital database and develop the query based information system to manage, retrieve and analyse of this digital database by considering one model mandal from paraksam district of state of Andhra Pradesh, India. This information system is termed as **Mandal Information System (MIS)**

Mandal Information system is defined as a system that process the digital data about the natural resources, topography, census, utilities, land use / Land cover and its associate features, basic terrain details, settlements, water bodies, drainage network and its associated resources at village level. The MIS developed in this research will be compatible for integration of digital database at village level with sociological, economic and environmental data in support of its micro level planning. This MIS is an application that not only disseminates information, but also proactively interacts with the user to aid them in their task of extracting necessary information is therefore presented to the user in a bi-directional manner in a web based MIS with the help of upcoming and advanced technology, namely Geomatics. Geomatics Technology comprises of remote sensing, GIS and GPS; which is developed at a significant pace over the past two decades and play a key role in development of Spatial Information System. In the present study, web based Mandal Information System is developed using Geomatics.
2.0 OBJECTIVES

➢ To generate both spatial and non spatial data: Primary data through field survey and GPS methods, thematic data using high resolution satellite remote sensing, topographic data using SOI toposheets and collateral data from various concerned organisations.

➢ To create the spatial digital database with the help of IRS-P6 LISS-IV MX satellite imagery and Survey of India (SOI) toposheets on ARCGIS platform and its integration with non-spatial data and the GPS data. This integration leads to the development of web based MIS.

➢ To Design and implementation of functional, explicit and user friendly menu screens for database maintenance, information query, information retrieval and query on spatial and non-spatial database using .net software (ASP.NET)

➢ To develop the website for Mandal Information System (MIS) for extraction of micro level data, which can be used for various applications like developmental project activities and environmental management at village level.
3.0 DATA PRODUCTS USED

Development of web based MIS needs baseline data, thematic data, topographic data and collateral data. All such data products are derived and extracted through various sources which are given in the following table.

<table>
<thead>
<tr>
<th>Type of Data</th>
<th>Source of Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toposheets (1:25,000 Scale)</td>
<td>SOI (Survey of India), Hyderabad</td>
</tr>
<tr>
<td>Cadastral maps</td>
<td>Central Survey office, Hyderabad.</td>
</tr>
<tr>
<td>Satellite Data (LISS-MX)</td>
<td>NRSC (National Remote Sensing Centre)</td>
</tr>
<tr>
<td>Village Infrastructure and Utilities Information</td>
<td>Revenue office, Mandal office and Village panchait offices.</td>
</tr>
<tr>
<td>Forest Boundaries</td>
<td>Forest department and using GPS survey</td>
</tr>
<tr>
<td>Census data</td>
<td>Bureau of Economics and Statistics (BES), Hyderabad</td>
</tr>
<tr>
<td>Industries Information</td>
<td>APPCB (Andhra Pradesh Pollution Control Board) and district Industrial Centre</td>
</tr>
<tr>
<td>Meteorological Data</td>
<td>Indian Meteorological Department (IMD)</td>
</tr>
<tr>
<td>Agricultural and Water Resources data</td>
<td>AP Irrigation Departments and district Agricultural office</td>
</tr>
<tr>
<td>Individual house and utility wise database</td>
<td>GPS field Survey</td>
</tr>
<tr>
<td>Land use / Land cover map</td>
<td>Satellite data analysis</td>
</tr>
<tr>
<td>Other data like Administrative maps (Districts maps, mandal maps, forest maps)</td>
<td>Concerned Departments of State Government and Central Govt.</td>
</tr>
</tbody>
</table>
4.0 RESEARCH APPROACH

The step by step procedure to execute this research work is as follows:

- Delineation of the study area from toposheet no: 66A06NW, 66A06SE, 66A06SW 1:25,000 obtained from Survey of India (SOI) and Conversion of raster data to vector format and creation of baseline data using ARCGIS software
- Satellite image of IRS –P6, LISS-IV MX with spatial Resolution 5.8m X 5.8m is processed and hardcopy is created to develop the thematic maps for the study area
- Development of land use land cover data model and general legend at 1:10,000 scale for preparation large scale maps
- Preparation of thematic maps by adopting standard methods of digital and visual interpretation of satellite imagery
- Collection of attribute/Non-spatial data from concerned departments and other methods of derivation of the data products and also using GPS methods
- Integration of spatial and attribute data using ARCGIS software
- Development of final web based Mandal Information System (MIS) using ASP web software
The entire methodology is divided into three phases namely

**PHASE – I**
Data Model Development at large scale & Methodology preparation of the research work

**PHASE – II**
Data Collection
Georeferencing and generation of spatial data
Digital database creation for attribute data
Integration of both spatial and attribute

**PHASE – III**
(ASP.NET)
Web page design
Add database in the web pages
Spatial data linkup with ARCGIS in the web pages
Final web site generation

**5.0 SUMMARY AND CONCLUSIONS**
The Rural Development in India is one of the most important factors for growth of the Indian economy. The Ministry of Rural Development in India is an apex body to develop the rural sector implementing several developmental programmes and projects. It needs data related to rural areas at mandal / village level. This research work has been carried out to develop the web based “Mandal Information System” (MIS) as a model at village level to generate such data products, this system has been
developed by considering a typical mandal of prakasam district named as vetapalem mandal. Vetapalem is one of the coastal mandal of the district covering an area of 95.24 Sq.km. consists of five revenue villages and twenty-five hamlets with population of 70,000 above.

The web based MIS consists of seven modules and each module is identified as an icon on the home page of the website. The seven modules are: History, Socio-Economic data, Thematic maps, GPS survey points, Cadastral/Land parcel Data, Govt. programmes and other details

**History** gives historical information of district and mandal which includes its traditional and cultural importance from ancient days.

**Socio-Economic** icon contains dropdown list of 25 sub icons explains all the infrastructure facilities information village wise. **Thematic maps** like base, drainage, transport, LU/LC, watershed, geomorphology, slope and soil maps at large scale provides the database with internal linkage of ARCGIS software for updation add more database in the future **GPS & Cadastral Survey** provides point and survey number of digital data on georeferenced imagery and toposheets to add updated database for house, utility and survey points. **Government Development Work** includes, IndiraKranthi, Indiramma housing, NREGS, Sampurna Grameena Rojgar Yojana, Pensions and Indiraprabha and other development rural works details gives the database of work progress and its status to develop the rural sector and for **Other Details** icon, database of entire research work details, synopsis and Home university
link up was given. The required data for the preparation of EIA and EMP can be extracted from this web based MIS from any one or more than one module as the case may be; which will be used for the Environmental Clearance. The outlook of web page is:

This webpage MIS, very much useful for various applications like, assessment of the natural resources, evaluation of LU/LC patterns, understanding the topography, geology and Environmental Clearance. This MIS will be useful for industrial estate developers, Environmental professionals, academicians and researchers, for their works, understand the topography, geology, for environmental management, conservation and industrial development. Environmental professionals,
academicians and researchers has several advantages to get faster results.

6. Acknowledgements

The output of this Ph.D. work is a subset of the major R&D project sponsored by Department of Science and Technology (DST) - Natural Resources Data Management System (NRDMS) under National Spatial Data Infrastructure (NSDI). I am thankful to the authorities of NRDMS-DST, Government of India for providing necessary input, data products for completion of my research work.

I also acknowledge the technical support given by the Principal Investigator of this project, Dr. M. Anji Reddy, Professor and Director of Jawaharlal Nehru Technological University Hyderabad for allowing me to work in this project at Centre for Environment, Institute of Science and Technology, JNTUH
7.0 ORGANISATION OF THE THESIS

The Thesis titled “Designing and Development of web based mandal information system using Geomatics - A case study from prakasam district, A.P., INDIA” is organized in 7 chapters, the details included in each chapter is mentioned below.

- **Chapter 1** is devoted to general introduction, significance of the study, objectives of the research, study area description and research approach.

- In **Chapter 2, the existing** literature Survey in which the earlier studies carried using Geomatics in the present type of research work are discussed.

- The Overall methodology employed for carrying out the present study is presented in **Chapter 3** methodology for Database generation, database development, thematic map generation, attribute data development and web based development with Spatial and Attribute Data are discussed.

- The source and methods employed in generation of spatial database including the topographic data and other derived data are explained in **Chapter 4** Detail explanation of each thematic layer and the percentage distribution of individual classes within each spatial map are presented in detail in this chapter.

- **The Chapter 5** deals with the developed attribute data in the access tables, GPS point data of house and utilities and cadastral survey points of the study area.

- In **Chapter 6**, Design and development of web pages using ASP.NET and database linkage with the web pages are explained.

- Summary Conclusion of the present research work on web based MIS is given in **Chapter 7**.