

GIS Application for Land Planning and Management in Montserrat, West Indies

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1 Introduction

Montserrat, a small (39 square miles) Caribbean Island and overseas territory of the U.K, has severely suffered in recent past by natural disasters like hurricanes and volcanic activities. Particularly major volcanic eruption of June 1997 completely destroyed nearly two-third areas of the Island including airport, seaport and Plymouth, the capital and only urban settlement in Montserrat. Devastation at such large scale had an inauspicious impact on economic, social, environment and institutional infrastructures that resulted an immediate migration of nearly 62% population [1] to U.K, USA, and other countries. Following the volcanic risk assessment, undertaken by the Montserrat Volcano Observatory (MVO) in December 1999, the Island has been divided into three zones (Figure 1) – the safe zone (in north), the daytime entry zone and the exclusion zone [2].

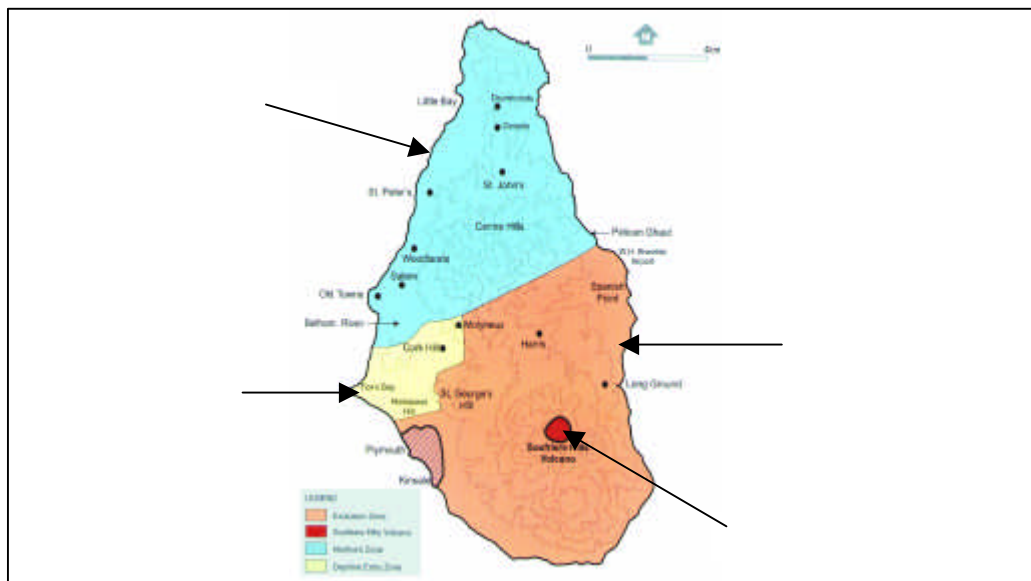


Figure 1: Volcanic Risk Assessment

The British Government, United Nations Development Programme (UNDP) and other international organizations are cooperating the Government of Montserrat in its massive efforts of rebuilding a socially and economically viable country. In this connection, an efficient planning of the available limited land resources has become inevitable and a major concern for the government. Physical Planning Unit (PPU), in collaboration with the Department of Lands and Survey (DL&S) and United Nations Volunteers (UNV) Programme, has been developing a GIS based Land Information System (LIS) for effective planning and better management of land resources. This GIS/LIS system will also provide bases for the development of a 'National Data Warehouse (NDW)', which

could effectively be utilized for the better management of various public utility services and other resources of the country. The proposed NDW will also provide support in economic development and social stability of Montserrat.

This paper presents some intermediate results, achieved so far, in establishing an intelligent LIS for Montserrat. It also demonstrates the overall methodology, adopted to achieve certain objectives of the project.

2 Objectives

Efforts towards establishing a GIS based LIS in Montserrat were initiated in mid 1998 by setting following primary objectives:

1. Computerization of existing manual Cadastre and Land Registry systems.
2. Digitisation of existing cadastral maps.
3. Development of core thematic layers for LIS.
4. Development of LIS by integrating all attribute and thematic databases.
5. Digital transformation of Aerial Survey, conducted in late 90s and its integration with the LIS to update existing maps and to create new thematic layers.

3 Methodology

A modular approach has been adopted to develop Montserrat LIS. Therefore, the project has been divided into phases for having better control and management over the available resources including financial, human, and timings. December 2004 has been set deadline to achieve project's primary objectives. A simple flow chart (Figure 2) presents all major activities involved in development of a fully functional LIS for Montserrat.

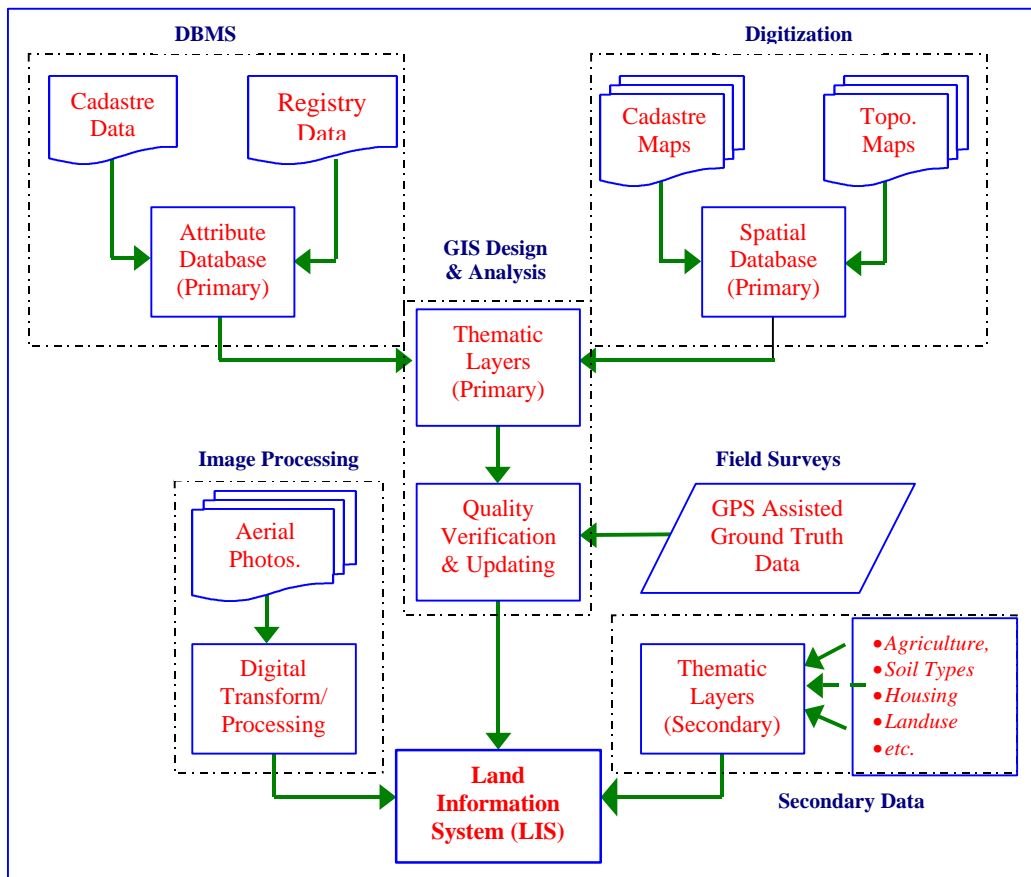


Figure 2: Flowchart showing activities involved in development of Montserrat LIS

4 Progress and Achievements

Montserrat is divided into 15 administrative sections and each section is further divided into subsections. Presently all development activities are being carried out only in 5 sections, which are located in northern safe zone of the Island. Development of other 10 sections has been suspended since 1997, as these have now become the part of the exclusion zone. Available cadastre and topographic maps of the sections of safe zone and daytime entry zone have been digitised and converted into thematic layers to establish an effective base for LIS. So far a total of 118 maps of different scales have been transformed into spatial database. Following themes/features have been developed and converted into shape files:

- Administrative boundaries,
- Road Network (primary and secondary)
- Hydrology (rivers, streams etc.)
- Coastal boundary
- Reserved Forest Areas
- Land Parcels
- Slopes
- Contours (at 50-foot interval)

Significant progress has also been achieved towards transformation of existing paper records of national cadastre, land registry and agriculture into Relational Database Management System (RDBMS). These numeric databases in integration with spatial database have set the nucleus for the most of landuse planning and infrastructure development activities in Montserrat.

5 LIS Applications

Montserrat LIS project is still in developmental stage and requires approximately two and half more years to achieve all its objectives. But its intermittent results and various GIS techniques are effectively being utilized in Montserrat to support landuse planning, infrastructure development, better management of utility services and other projects of good governance.

Montserrat LIS has successfully been applied to identify land ownership categories namely unclaimed, unutilised and under utilised lands in some of the residential areas for better landuse planning. Land parcels/properties in a section were divided into crown, private and unclaimed categories (Figure 3).

LIS/GIS has been found to be a useful tool in mapping changes/modification in “Physical Development Plan for North Montserrat 2000 – 2009” due to construction of a new Airport in Gerald’s area (Figure 4). LIS data has also been used to assess impact on land/property due to airport construction. This exercise greatly helped in formulating the land acquisition policy for the new Airport and also in defining new housing policy for this section of the island.

Utility services provider companies of Montserrat have also applied LIS base maps and associated data for better management of their services. Montserrat Water authority (MWA) has recently used LIS data and maps for mapping the existing water distribution network of the Island. Similarly Montserrat Electricity Services Limited (MONLEC) and Cable & Wireless have also been using this data effectively.

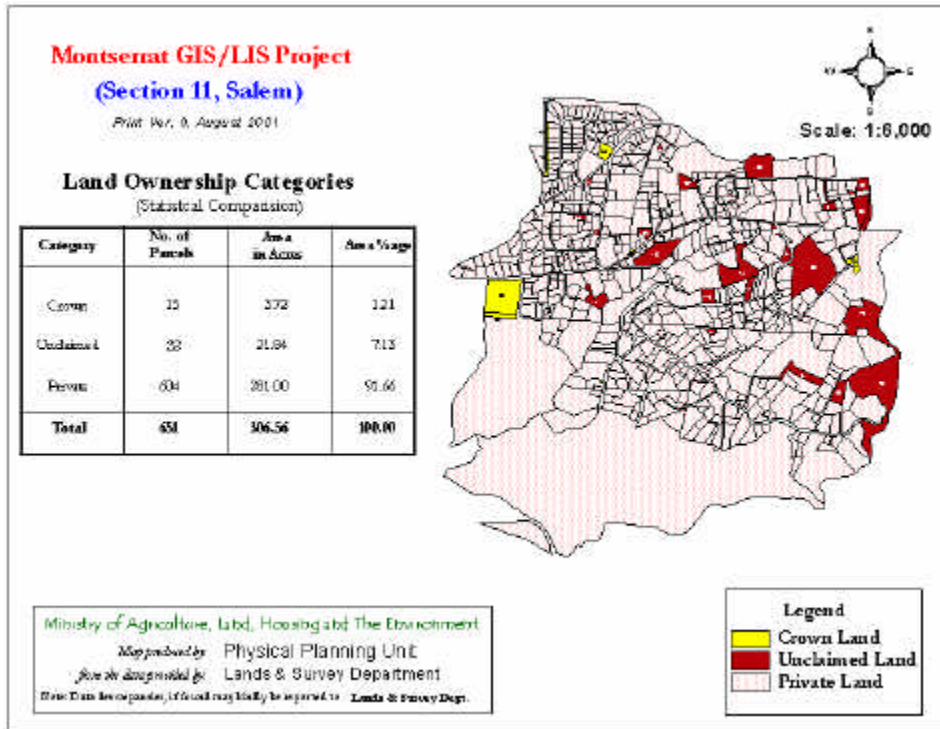


Figure 3: GIS/LIS application in landuse mapping & planning

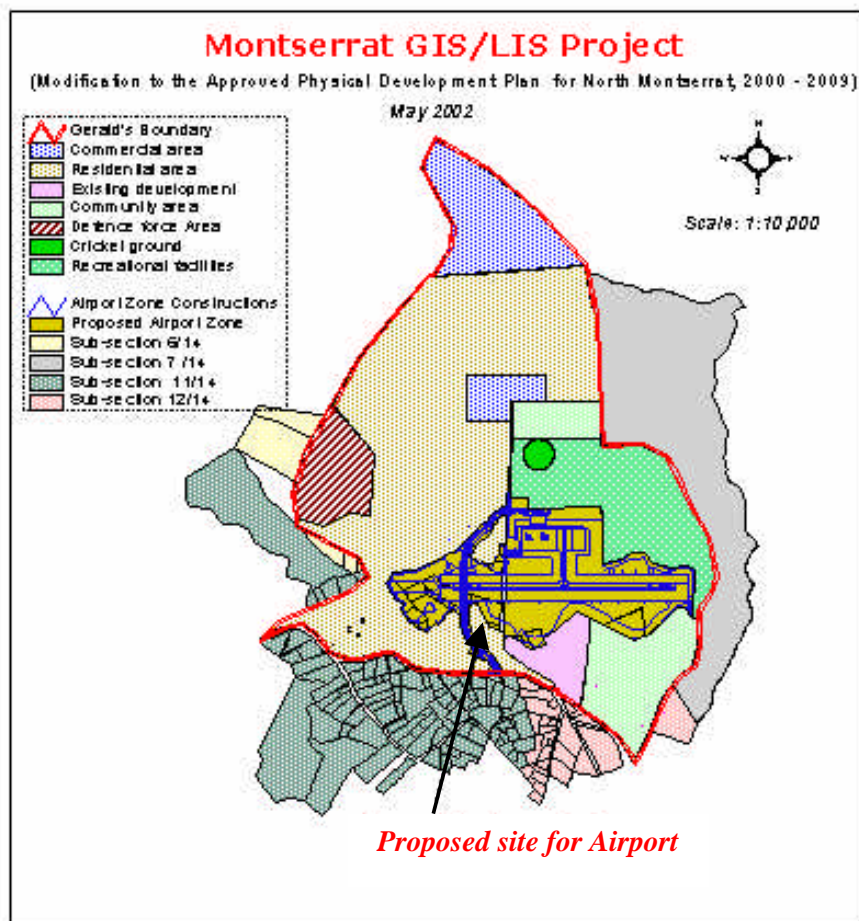


Figure 4: GIS/LIS Application in Physical Development

6 Use of GRASS in Montserrat GIS/LIS Project

There are some more objectives, which will be completed in future to establish a fully functional LIS for Montserrat. As explained earlier, processing of aerial survey data and its integration with GIS database will help in correction and updating of existing maps (cadastral, topographic and thematic). At present there is no digital image processing software is available for this project, therefore, GRASS, which is an open source software and can be acquired free of cost, will be used for this purpose. Hopefully, it will also help in GIS analysis and graphical designing at various stages.

7 Conclusion

LIS/GIS project that is currently in its developmental stage has proved its usefulness in various projects of physical planning and infrastructure development in Montserrat. It is hoped that in addition to land resource planning and management this LIS will also provide a strong basis for establishing a National Data Warehouse to strengthen the efforts of Government of Montserrat in rebuilding a socially and economically sustainable Montserrat.

Acknowledgment

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References

- [1] Development Plan on "Montserrat Social and Economic Recovery Programme – a Path to Sustainable Development 1998 to 2002", November 1998, page 1.
- [2] Approved Physical Development Plan for North Montserrat 2000 – 2009, Physical Planning Unit, Ministry of Agriculture, Land, Housing and the Environment, January 2000, page 5.