CHAPTER-3

3.0 METHODOLOGY:

Ecotourism planning requires exploring diverse types of natural and cultural attractions along with demographic characteristics, to provide the base for designing the travel industry different from the mass tourism standard. To fulfill this purpose Remote Sensing and GIS approach is to be used.

Due to essentially spatially distributed nature of tourism and terrorism related data and need of various types of spatial and statistical analysis, GIS applications have a great relevance in this study.

3.1 SPATIAL PATTERN ANALYSIS OF SEDITIOUS MOVEMENT / ACTIVITY

3.1.1 Base map Creation of the study area

In laboratory different techniques (**Geo-referencing**) were performed for Base map Creation of the study area with the help of s/w Arc-GIS 10.3 using District map and satellite images.

3.1.2 Spatial data collection on extremist movements: Newspaper report; crime records from the office of the Superintendent of Police, Purulia, Bankura, Paschim Medinipur primary survey in local party offices and forest villages will be the main source of data. Data will be plotted on the base map as point layer.

3.1.3 Locating Potential Hot Spots: Thematic maps have been used to predict likely sensitive points/areas and the infrastructure available to deal with any crisis in those areas. Data of surface communication, and demographic pattern can all be used to predict sensitivity of a locality in relation to a given time. For example, a shopping mall has a high population density in the evening but is empty in the early hours of the day whereas a call centre has high population density during nights.

3.1.4 Geographic Profiling: Geographic profiling have been used as the building block for several investigative strategies, including suspect and tip prioritization, address-based searches of police record systems, patrol saturation and surveillance, neighborhood canvasses and searches. GIS technology, by high-end spatial analysis and querying highlights the crime location, any physical boundaries that were present, and the types of roads and highways that

come into both the abduction and body dump sites. The basis of geographic profiling is the link between geographic crime site information and the known propensities of serial criminals in their selection of a target victim and location. GIS can be used to produce a map of the most probable location of the criminal's centre of activity, which in most cases is the offender's residence.

Geographical analysis can also track the routine activity of the victims, because people tend to stick with familiar territory. That means that an analysis of all the crime scenes could provide clues about where an offender lives. Like psychological profiles, those who concentrate on geographical analysis are also trying to determine how sophisticated and organized an offender is, whether the crime was planned or opportune, and whether the offender approached a high or low risk victim. However, they are also trying to take it a step further to use objective measurements to pinpoint as precisely as possible the locus of criminal activity. The construction of a geographical profile involves:

- Complete familiarity with the case file
- Examination of the crime scenes
- Study of area maps
- Analysis of neighborhood demographics for both the abduction site and body dump site
- Computerized analysis

Using this information, the next step is to determine the geographical coordinates of incident and the physical address of where the victim was last seen or abducted from. The best measures are made by visiting all crime locations and obtaining geographical coordinates with a global position unit.

GIS can be used to produce thematic maps on any of the above parameters enumerated and these can provide analysts with clues to patterns of crimes. A thematic map with age of victims as a criterion, for instance, will quickly present the officers with specific areas highlighted in different colors.

3.1.5 Spatial data collection on existing law enforcement agencies: Location of police stations out posts, military camps and their jurisdiction area will be plotted on the base map to determine their positional accuracy and adequacy in combating terrorism.

3.1.6 Detection of routes of terrorist movement: Based on the primary and secondary data on the pattern of occurrence of crimes and land use / land cover information, forest

tracks and gullies revealed from high resolution IKONOS data (GCR-1.0m) and terrain analysis; the route of operation of terrorists will be determined.

3.2 EXISTING / PRESENT SECURITY INFRASTRUCTURE MAPPING:

Digitization refers to the creation of vector data from raster images that are traced using mouse on display device. At first digitized district map, toposheet with the help of point tool in .shp file format.

3.3 POTENTIAL SITE SELECTION FOR ECOTOURISM (Ep):

Keeping in mind the basic thirsts of an ecotourism potential sites will be selected based on eight criteria:

- **(El)** The spot must be above an elevation of 500m and near the edge of the hill, that tourist can have a bird's eye view of the downstream plain.
- **(Vd)** To feel in the lap of the nature and for adventure also, there must be dense to moderate forest cover.
- **(Wb)** There should be a river, dam or other water bodies near the spot.
- **(Sp)** Fertile agricultural lands are to be avoided only barren lands and forest-fringes are to be used.
- **(Pd)** Solitude is always a major demand of the Eco tourists, therefore Mouzas with very low population density are preferred.
- **(Rc)** All the spots must be connected by roads.
- **(Fl)** There should have some food & lodging facilities, but these could be buildup latter also.
- **(L)** To develop ecotourism infrastructure (Tourist cottages / rest houses, green hotels and restaurant, public convenience facilities, Tourist Information center, camping ground etc.) there must be at least 200 ha. of level ground, preferably under forest cover.

$$Ep_i = \sum(El_i + Vd_i + Wb_i + Sp_i + Pd_i + {}_i + Rc_i + Fl_i + L_i)$$

Where weightage (i) = 1,2,……n.

These criterions are to be taken as the parameters to evaluate the areas of high ecotourism potential. For this purpose a '*Weighted Sum Overlay Analysis'* method will be adopted. The input in the form of ARC/GIS coverage will be assigned relative weightage in accordance to its influence/importance in decision making based on expert opinion, and each other class in the individual coverage will be ranked according to its potential of being for being developed for ecotourism.

3.3.1 Collection of RS data (satellite images): For Cadastral level planning high-resolution satellite images will be required. IRS LISS-IV (5.8m) / IKONOS (1.0m) data of the year 2014-15 will be purchased from Data Centre, National Remote Sensing Agency, Balanagar, Hyderabad-500037.

Satellite imagery LANDSAT- 8 data of 25th February 2015 pertaining to the study area has used download from USGS (Path/Row – 145/44&45)

3.3.2 Collection and study of collateral data: Survey of India (SOI) topographical maps from National Atlas and Thematic Mapping Organization (NATMO), Kolkata-64; PS/Block map and Mouza maps from Land Record Office - Kolkata Land Revenue Department, Govt of West Bengal; Soil Map-1991, Published by National Bureau of Soil Survey and Land Use Planning (NBSS & LUP) Salt Lake Kolkata; Tourist information Map from **Department of Tourism,** Government of West Bengal, 2-Brabourne Road, Kolkata – 700001; and other available information in the form of latest publications and maps.

3.3.3 Ground Truth (GT) collection: Field data collection of the study area. Here collection the all police station or camp and military camp. Collection the last ten years Maoist attacked information.

3.3.4 Digital Processing

3.3.4.1 Geo-referencing: At first Toposheet, Mouza, Satellite imagery map have been geo-referenced to the projection Geographic lat-long; Spheroid: - Modified WGS84, Datum: - WGS84, then reproject it to Lambert conformal conic; Spheroid: - Modified WGS84, Datum: - WGS84.

3.4.4.2 Classification: Visual interpretation of geocoded false colour composite imageries on the basis of tone or colour, texture, pattern, relative brightness etc. For delineation of different land use categories ERDAS IMAGINE software package or other suitable image processing GIS software may be used to get more precise information on the basis of DN values. The entire area may be classified by supervised technique using maximum likelihood classifier.

3.3.5 Digital Elevation / Terrain Model (DEM / DTM): DEM will be generated by digitizing the contour of the toposheet and adding elevation data, or it could be directly obtained from SRTM data. Thematic maps on elevation, relative relief, and slope will be

prepared based on this model. An essential parameter used in the study –Relative relief was derived from the ASTER (Advanced Space borne Thermal Emission and Reflection Radiometer) DEM that was obtained from USGS, USA.

3.3.6 Generation of socioeconomic theme maps : Map showing village / mouza boundaries shall be sourced from Block map which would be input as a GIS layer and socio-economic attributes will be added from District Census Hand Book – 2011, Directorate of Census Operation, West Bengal. Prioritization map showing various levels of socioeconomic strata would be developed by generating suitable algorithm.

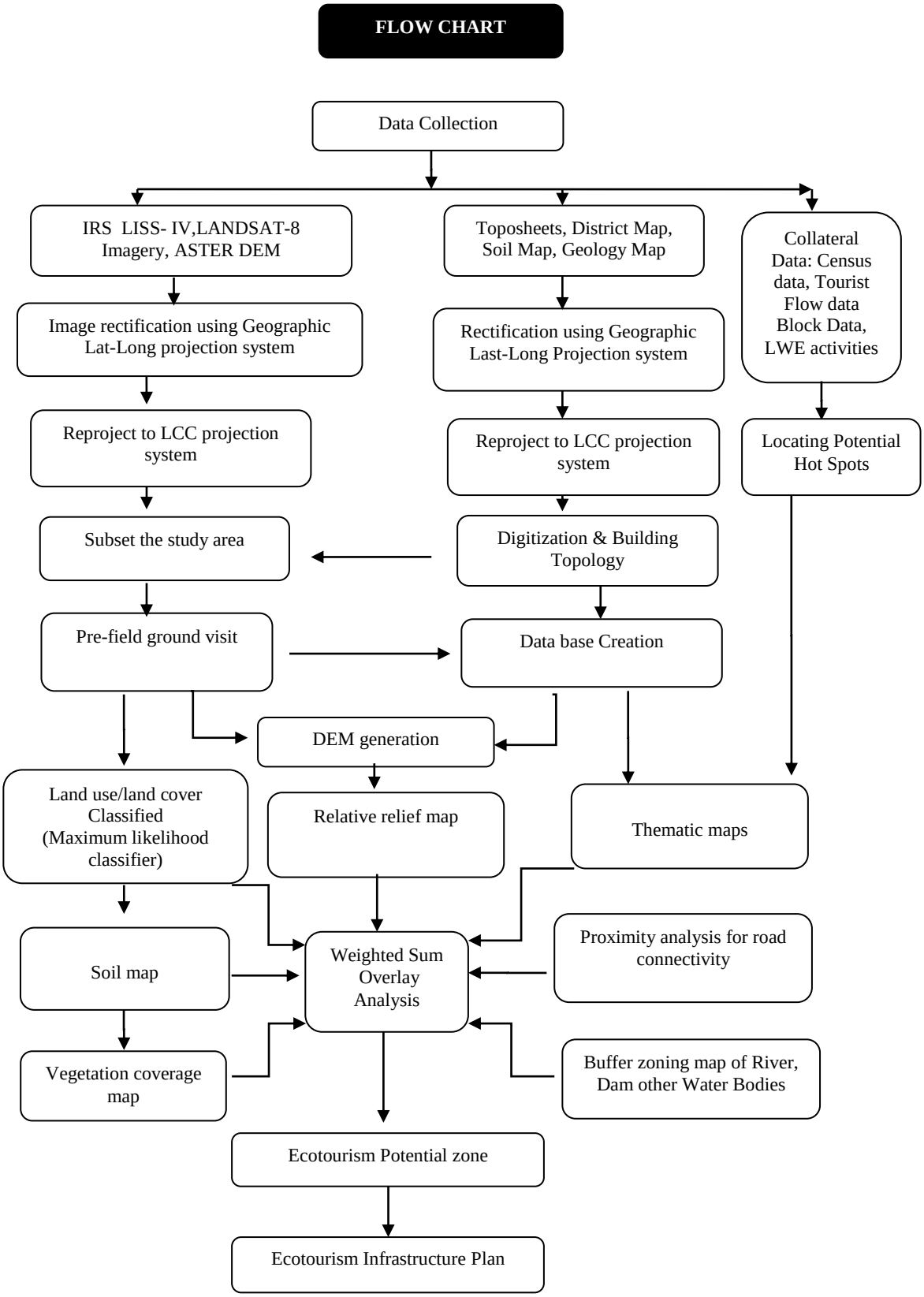
3.4. ECOTOURISM INFRASTRUCTURE AND SUSTAINABLE LAND USE PLANNING:

3.4.1 Land capability classification: The methodology essentially employs overlay analysis of different GIS layers e.g. satellite Remote Sensing data, Hydro-geomorphological map and Soil attribute maps etc. Also the annual range of temperature, pattern of rainfall and irrigation facilities, slope, shape, sizes and physiographic position play a major role in deriving the optimum land use plan. The total process will be carried out by Arc-GIS software.

3.4.2 Land use planning: Preparation of an action plan, tourist spots will be under the village / mouza boundaries .shp files database are generated by digitizing the Survey of India (SOI) mouza maps and overlaying different thematic maps.

3.5 SECURITY RESTRUCTURING IN RELATION TO PROPOSED TOURIST SPOTS:

Preparation of an action plan how many tourist spots will be under the control of one police station; wherever allocation or relocation of police outposts are necessary and how self protection groups will form and work with intimate interaction, consultation, and co-ordination with local law enforcement agencies.


FLOW CHART
Data Collection
IRS LISS- IV,LANDSAT-8 Imagery, ASTER DEM
Toposheets, District Map, Soil Map, Geology Map
Collateral Data: Census data, Tourist Flow data Block Data, LWE activities
Image rectification using Geographic Lat-Long projection system
Rectification using Geographic Last-Long Projection system
Reproject to LCC projection system
Reproject to LCC projection system
Locating Potential Hot Spots
Subset the study area
Digitization & Building Topology
Pre-field ground visit
Data base Creation
DEM generation
Land use/land cover Classified (Maximum likelihood classifier)
Relative relief map
Thematic maps
Soil map
Weighted Sum Overlay Analysis
Proximity analysis for road connectivity
Vegetation coverage map
Buffer zoning map of River, Dam other Water Bodies
Ecotourism Potential zone
Ecotourism Infrastructure Plan