

Chapter 1: INTRODUCTION

1.1 Scope of Study

Planning is a basic human activity that involves thinking ahead and organising to achieve given objectives. The function of the planning system is to regulate the development and use of land in the public interest and to reconcile current requirements with the need to protect the natural and historic environment. Planning is essentially a process of a number of tiers of decision-making. Planning must also have a distributive bias from the point of view of distributing the gains of planning and distributing the ownership and control of the material resources of the community by regulating the economic system of the national (or local) economy.

Decentralised planning in India is still in the stage of experimentation. However, the 3 tier pancheyeti raj institutions in West Bengal armed with 73rd and 74th constitution amendments play vital role in decentralized planning i.e., gram pancheyet, pancheyet samity and zilla parisad. The decentralised planning rests on three objectives: (i) appreciation of macro-level *spatially dispersed* economic activities pursued at micro-level/small scale at household and village levels; (ii) bringing the *peripheral groups* of poor and disadvantaged within the mainstream economic processes requires programs, personnel and organisational *structures* at the grassroots for identification, delivery, initial support and guidance towards viability and (iii) *participatory mechanisms* in the planning with a view to promote motivations habits of self-help and local level leadership. In addition to districts, blocks and gram pancheyet, recently a great deal of stress has been laid on the adoption of micro-watershed as the planning unit.

Micro-level development planning over the last 20 years have made it clear that sustainable management of natural resources cannot be achieved without the participation of those who use these resources. The programs undertaken at the gram pancheyet level are of direct relevance and of direct interest to the villagers. And when local plans are expounded, discussed and approved at the gram samsad level, the villager becomes a participant in the process of plan formulation.

The participation and involvement of the common people in the planning process require that a part of the decision-making process should be left to the people themselves. They must decide on the priorities of development in so far as there are many schemes to choose from, and they must be made to work out their solutions to pressing problems of the area in terms of their own perceptions of needs and priorities. This is *where geo-informatics can be of direct use* in visualising for the villages the consequences of alternative priorities as well as decisions on location, e.g. of check dams, wells, SSK, irrigation, roads etc.

Geographical Information System (GIS) and/or geo-informatics is an emerging discipline defines as *powerful set of tools for collecting, storing, retrieving at will, transformation, and displaying spatial data from the real world* (Burrough, P.A., 1986) is a computer-assisted system designed to capture, store, edit, display and plot geographically referenced data. It has the capability to make quick and unbiased decisions, which includes distance, directions, adjacency, relative location spatial decision support mechanisms.

Geo-informatics is useful at the analysis, forecasting and plan formulation stages. At the *plan formulation* stage, through the use of map overlays, land suitability maps can be used in the creation of master plans and land use plans. With the use of a GIS, the spatial impacts of alternative plans can be evaluated to assist planners, administrators and the PRIs in selecting the most appropriate plan. At the *implementation* stage, a GIS can be used to evaluate development proposals, development control, zoning, and approval of subdivision schemes and impact studies of large-scale development projects. Finally at the *monitoring* stage, it can help to detect land-use and environmental changes and to monitor whether or not development is progressing according to the plan.

In spite of its vast natural resource base, Dhupguri is among the backward block in Jalpaiguri district as well as in the country. The long international borders with Bhutan coupled with huge influx of migrants since independence have made it a strategic location. Because of burgeoning population pressure, the natural resource base per capita is declining which in turn is creating problems of mismatch between demand and supply. On the other hand, ad hoc interventions on the natural system with myopic view are resulting in downslide in quality of environment, resulting in the increase of frequency and magnitude of disasters. It is a challenge that demands innovative response. The knowledge and insight gained through geo-spatial multi-level database management and the GIS technology have to be

meaningfully applied considering the intricate web of the ground reality of natural and cultural resources in multi-level development planning. Among the perennial problem of Dhupguri, poor irrigation facilities, lack in infrastructure and also routine flash floods resulting in large scale loss of properties.

The Dhupguri block produces a huge quantity of surplus fruits and vegetables. The lack of cold storage and marketing facility are major impediment to the growth of this sector. On the other hand, those factors influence unwarranted transformation of agriculture-land to tea gardens, which again face lower acceptability in the international market. Despite profuse reserves of groundwater, some parts of the block is still facing drinking water crisis. Deforestation has been a great menace. People virtually eking out on poor agriculture depend on forest produce and forest has been the surrogate source of income.

Under this backdrop, the proposed study aims to provide the pancheyet to block level development planners with a very powerful tool of multi-level geo-spatial digital database at a scale of 1:3960 on natural and cultural resources. The GIS thus, developed would reduce the dependency of development planners from guessing/ assuming in the planning processes and also equip them with the facilities of plan optimization.

1.2 Area of Study

The rectangular shape Dhupguri block (Latitudes of $26^{\circ} 54'$ to $26^{\circ} 30'30''$ N and Longitudes of $88^{\circ} 52'30''$ to $89^{\circ} 08'$ E) in Jalpaiguri district comprising an area of 544.10 sq. km. is elongated in north-south direction and is bordered by Nagrakata and Maynaguri in the east, Bhutan in the north, Birpara – Madarihat and Falakata blocks in the east and Kochbehar district in the south (Fig. 1.1). The block consists of 2 police stations, 16 gram pancheyets, 247 gram samsad and 108 mauza including 22 tea garden mauza and 3 forest mauza. Out of the total population of 418461, 41.8% was schedule caste and 18.9% was schedule tribe population (2001 Census Report).

1.3 Hypothesis

Dhupguri block, in spite of its vast natural resource base, is still under-developed and backward. The long international borders with Bhutan coupled with huge influx of

migrants since independence have made Dhupguri a strategic location in Jalpaiguri district. Because of burgeoning population pressure, the natural resource base per capita is declining which in turn is creating problems of mismatch between demand and supply.

On the other hand, ad hoc interventions on the natural system with myopic view are resulting in downslide in quality of environment, resulting in the increase of frequency and magnitude of disasters. It is a challenge that demands innovative response. The knowledge and insight gained through geo-spatial multi-level database management and the GIS technology have to be meaningfully applied considering the intricate web of the ground reality of natural and cultural resources in multi-level development planning.

The geo-informatics thus proposed aimed to provide a scientific base for agricultural, industrial, socio-economic and human resource development on a sustainable basis taking into consideration the latest ground reality. The development planners at the field level will have the access to available potential resource for further exploitation/use as well as possible hazards to be encountered and human resource available at pancheyet to block level in computer compatible format. The anthropogenic activities along with infrastructure data will also be documented.

Therefore, the development planning at grass-root level will be hopefully based not on assumptions but on dependable database. The quality of planning and intervention will, therefore, be unbiased and realistic, scientifically sound and environment friendly. The outputs will be beneficial to all the sections of the society and expected to be utilized in decentralized planning for poverty alleviation.

1.4 Objectives

The main objective of the study is to develop geo-informatics for development planning at Dhupguri block through the application of ArcGIS 9.1 platform and to demonstrate its application potential in micro-level/grass-root level development plan. It is designed to provide the block-based planners and/or PRIs at gram pancheyet level with sensitive tools for rapid information retrieval, analysis, integrations and decision support module of multi-level geo-spatial data to satisfy the need of the 73rd and 74th Constitution Amendments. This will hopefully usher new era in arriving at informed planning decisions

through optimization exercises from panchayet to district level. There will be five broader objectives:

- a) To develop geo-referred digital geo-spatial database of Dhupguri block at a scale of 1:3960 under ArcGIS 9.1 platform.
- b) Delineation of pancheyeti raj boundary and infrastructure allocation based on GPS.
- c) To demonstrate application potential of the developed database and GIS-based tools for micro-level development planning.
- d) Development of decision support modules.

1.5 Methodology

Keeping in mind the enormity of work for the creation of integrated geo-spatial database at gram samsad level of Dhupguri block and to demonstrate the application potential of block level geo-informatics in multi-level development planning the following methodology is proposed:

Reconnaissance includes compilation of the upgraded and delineated maps produced under the NRDMS programme in Jalpaiguri district (2002-2004). These maps be scrutinized to formulate survey layout and GPS data collecting schedule in the field. After consulting with the respective B.D.O., B.R &L.R.O. and PRIs the plan for field survey will be finalized.

Need assessment of the line departments and Institution of pancheyeti raj has been performed through interactions with the respective officials and elective representatives. Effort has also been made to assess the current and expected need of spatial and non-spatial data in their respective development plans. Compatibility of available data from the line departments and ISGs has been scrutinized. This is followed by the assessment of data gap and to fill such critical gap through the generation of primary data by field survey in cooperation with the respective line departments and/or I.S.Gs.

Extensive GPS data capture for vector generation of infrastructure, topography and GCPs (ground control points) generation has been performed. The CCA data from the village registrars has been collected from the 16 gram pancheyets. Fresh survey has also been made to fill the blanks in data and to rectify or/and gather additional information.

Registration of maps and images has been done based on i) mauza maps and PS maps be individually geo-coded into files with UTM projection (WGS84 datum) based on extensive GPS data capture; ii) these are layered into two mosaic files; iii) PAN image has been geo-coded on the basis of GPS control points iv) LISS 3 image be geo-referenced on the basis of mosaic PAN file; v) the PAN and LISS 3 be fused into a scene covering the entire Dhuppuri block.

Keeping in mind the flexibility and capability of handling the large Geo-spatial database, ArcGIS 9.1 platform has been selected. All territorial boundaries including gram samsad and gram pancheyet, physical features i. e., river, nala, wetland, badland, sand deposits, river bank erosion, vegetation etc, cultural features like roads including village road, railways, pipe line, power line, telephone line, irrigation canals, embankment, dam, reservoir and infrastructure including education & cultural facilities, health & nutrition, trade & commerce, administrative, religious etc. will be digitized. Macro features, infrastructures have been done upgradation through GPS. Attribute and *track-log* data accessed through GPS has been converted into Shape format to incorporate into the ArcGIS platform for upgradation. Image processing will be done under Gram⁺⁺ platform and necessary layers will be incorporated into the master file under ArcGIS 9.1 for database development and theme generation.

The database has been developed under ArcGIS 9.1 MLK platform. Both special and non-spatial data will be attached. The tabular data will be attached from Excel through unique ID for SQL and thematic map generation. The methods and/or source of multi-level database in Dhuppuri block includes:

- Revenue village level data from Census India 2001.
- Gram samsad and gram pancheyet level data will be collected from the CCA registrar available in 16 gram pancheyet offices of Dhuppuri block.
- Village registrar and/or CCA registrars will be scrutinized, verified and crosschecked;
- In case of doubt and/or inconsistency in data field verification will be carried out
- Listing of gaps in datasheet and/or available in non-compatible format;
- Launching of fresh field survey to fill in the blanks and capturing new data

- Collection and synthesis of data on agriculture, irrigation, trade & commerce, meteorology, tourism, transport, soil, water resource, flora & fauna, health & sanitation, education, child & family welfare, tribal development etc. from the line departments.
- Geo-spatial database structure for over one hundred different fields of natural and socio-economic resource base will be formulated with the ultimate aim to assist the decentralized planners to develop sustainable development planning.
- Development of computer compatible multi-level resource profile in the form of thematic maps, tables, charts etc.

Synthesis of natural and cultural resource database for its optimum utilization has been performed under ArcGIS platform to achieve the following:

- SWOT (Strength, Weakness, Opportunity and Threat) analysis
- Regional disparity in resource appreciation
- Status of HDI (Human Development Index)
- Thrust area for further development
- Thematic map generation on various planning aspects.

Demonstration of application potential of geo-informatics in multi-level development planning for poverty alleviation has been done through proto-type models of informed planning processes. The investigator has the opportunity to work under the NRDMS programme in Jalpaiguri district sponsored by the Department of Science & Technology since 2006. The knowledge and insights developed during the process will be applied in the present research programme. Also the infrastructure and facilities will also be accessed with due permission of the concern authority.

1.6 Expected Outcome

The output of the proposed study consists of the digital geo-referred pancheyeti raj map of Dhupguri block showing multi-level boundaries, physical and cultural resource base, infrastructure allocation at a scale of 1:3960 and multi-disciplinary data at gram samsad level on natural resources/hazards and co-lateral data on demographic, social, economic and

infrastructure in ArcGIS 9.1 platform. In view of the 73rd and 74th Constitution amendments, the integrated geo-spatial database at gram samsad level would play the vital role in guiding the decentralized planning processes in right direction in Dhupguri block.

The digital geo-spatial database thus created could be disseminated among the officials and functionaries of block level line departments and I.S.Gs to demonstrate the innovative power of the new technology. Since, the multi-layer geo-spatial data will be geo-referred the line departments and other users would be able to upgrade it as per their requirement with the help of Satellite data (NRSA) and correlate with co-sectoral data to generate necessary information produces. The geo-referred upgraded map of Dhupguri block would be of immense help to all sections of decision makers in formulating and executing the various development plans at grass root level, in addition to the researchers who would like to undertake further study on specific problems.

1.7 Limitations

There is some risk involved in samsad level data captured from the village registrar (CCA) regarding its quality/reliability. There is also some risk involved in the assumption that data of required quality and scale has been available from line departments. However, the investigator has scrutinized, verify and cross-checked (5% sample) data available from secondary sources and also undertake fresh survey for capturing the primary data to fill the gaps.