

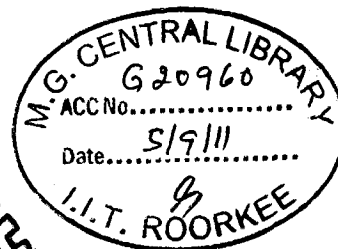
PLANNING FOR INTEGRATED DEVELOPMENT OF TINSUKIA DISTRICT, ASSAM

A DISSERTATION

*Submitted in partial fulfillment of the
requirements for the award of the degree
of*
MASTER OF URBAN AND RURAL PLANNING

By

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JUNE, 2011**

CERTIFICATE

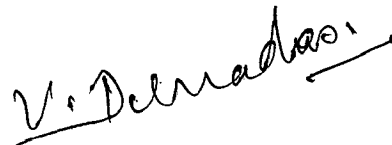
Certified that this dissertation entitled '**PLANNING FOR INTEGRATED DEVELOPMENT OF TINSUKIA DISTRICT, ASSAM**' which has been submitted by Ms. Debapriya Guha in partial fulfillment of the requirement for the postgraduate degree of **MASTER OF URBAN AND RURAL PLANNING**, submitted in the Department of Architecture and planning, Indian Institute of Technology, Roorkee, is the student's own work carried out by her under our supervision and guidance. The matter embodied in this dissertation has not been submitted for the award of any other degree elsewhere.

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CANDIDATE'S DECLARATION

I hereby declare that the work which has been presented in this dissertation entitled as 'PLANNING FOR INTEGRATED DEVELOPMENT OF TINSUKIA DISTRICT, ASSAM' in partial fulfillment of the requirement for the award of the postgraduate degree of MASTER OF URBAN AND RURAL PLANNING, submitted in the Department of Architecture and planning, Indian Institute of Technology, Roorkee, is an authentic record of my own work carried out by me during the period from August 2010 to June 2011 under the supervision and guidance of Prof. R. Chandra and Dr. V. Devadas.

The matter embodied in this dissertation has not been submitted by me anywhere else for the award of any other degree elsewhere.

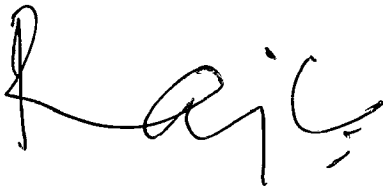
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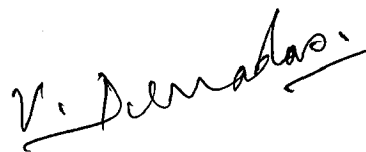

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This is to certify that the above statement made by the candidate Debapriya Guha is correct to the best of our knowledge and belief.



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ABSTRACT

Integrated development plan at micro level planning takes in to account the essential needs of the local people, and arrive at policies for judicious use of the locally available resources. A successful micro level plan relies upon the key-planning tool, such as, systems analysis, operation research, statistics, socio-economic evaluation and infrastructure system. An urban system comprises of several interacting subsystems, such as physical, social, economic, ecology, environment, infrastructure, and institutions. All these subsystems are interlinked and interdependent to each other functioning as a whole. All the subsystems, comprising the urban system are inextricably linked since they not only are interconnected but also are interdependent on each other.

The Investigator has made an attempt to understand the physical, socio-economic and environmental conditions, level of infrastructure facilities, which exists in the system at grassroots level. To understand the real functions of the study area at the grassroots level, survey research techniques have been employed to conduct the investigation. The most important infrastructure services, which decide the functions in a particular system, such as housing, health, education, power and energy were considered along with population and population growth in the system.

Tinsukia district, one of the 23 districts of Assam, was selected for the purpose of this investigation. The Investigator observes that integrated development of the study area is very much essential for holistic development of the system, and therefore an attempt has been made to develop conceptualized urban system model by considering various subsystems and their controlling parameters obtained from the analysis to evolve plausible policy recommendations for integrated development of the study area. Further, various theories like System theory, Polarized Regional and growth pole concept were employed in this investigation. Projections are done for the year 2031 A.D by employing suitable statistical techniques for forecasting the demand and supply of infrastructure in the system. Finally, a set of plausible policies are evolved and recommendations are made for achieving integrated development in the study area.

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CHAPTER – 01
INTRODUCTION

1.1 BACKGROUND: In 2001, about 286 million persons were living in urban areas of India and it was the second largest urban population in the world. The 74th Constitution Amendment Act (CAA) came into force in June, 1993 which sought to improve strengthen urban governance and management of services. The 73rd and 74th Amendments of the Constitution mandating the establishment of Panchayats at the district, intermediate and village levels clearly envisaged a reversal of the hitherto centralised approach to district planning. The 74th Constitutional Amendment Act mandated the establishment of the District Planning Committee (DPC) for consolidating plans prepared by Panchayats and municipalities in the district into the Draft District Plan. The Central Government's interest in strengthening local governments also emerges from the widespread need for institutional changes to enable and sustain greater access to basic local services, as well as from the considerable investments it currently makes in local service delivery functions, through Centrally Sponsored Schemes (CSS).

The urban population is expected to rise to around 38 per cent by 2026. India has to improve its urban areas to achieve objectives of economic development. Huge investment is required in India's urban sector. Since public funds for these services are inadequate, urban local bodies (ULBs) have to look for innovative approaches for financing and management of urban services.

1.2 PLANNING IN ASSAM: Economic planning is a well accepted method of economic development everywhere now-a-days. There cannot be a dilemma about the acceptance or non-acceptance of planned method of development. The per capita income of India is extremely poor due to under-development of the Indian economy. Moreover, some poor states of India like Assam, Orissa etc. are facing acute problems of economic deficiencies. To cure all these economic planning has a special role to play. Thus along with the other states of Indian Union economic planning has also been started in Assam to set the economy of the State at a right level. The decentralised planning introduced in Assam is confined to sub-divisional level instead of district level as introduced in other states of our country.

1.3 MAIN OBJECTIVE OF PLANNING IN ASSAM: The fundamental objective of economic planning is to accelerate economic development of the region through optimum utilisation of its resources so that a reasonably high standard of economic well being can be attained by the masses. Another very important objective of economic planning in

INTRODUCTION

Assam is to reduce the disparities in income and wealth to the minimum level. So, it can be said 'Growth with social Justice' has been considered as the main objectives of economic planning in Assam.

1.4 APPROACH TO PARTICIPATIVE DISTRICT PLANNING: We are at a unique juncture where participative decentralised planning is gathering momentum. Side by side, innovations in Information and Communication Technology have made it possible for the vision of participative planning, articulated over a long period, to be effectively implemented on a countrywide scale. The time is now ripe for grounding participative planning from the grassroots level upwards led by local governments, so that plans relevant to the local area are prepared, with local communities and their local governments gaining a strong sense of ownership. This alone will lead to better outcomes and results.

1.5 SELECTION OF TOPIC: The most important problem in all planning activities is how to integrate the projects in programs in different sectors. The sectoral priorities in an area development plan should, by and large, confirm the overall pattern envisaged at the district level. District is the smallest administrative unit. Tinsukia district is one of the vibrant districts of Assam. There is disparity among rural and urban areas in terms of facilities, physical and social infrastructure. The high political instability in the district has also triggered backwardness and slow pace of development. The initiatives by the government do not reach grassroots level. These were some of the problems that concentrated my vision in this direction.

CHAPTER – 02

AIMS AND OBJECTIVES

AIMS AND OBJECTIVES

2.1 AIM: To evolve an integrated development plan and a set of policy guidelines for the development of Tinsukia district, Assam.

2.2 OBJECTIVES:

- To assess the existing conditions of all sub – systems of the system (district).
- To identify the control parameters, which decide the function of the system.
- To forecast the demand and supply of infrastructure services for 2031 A.D. for the development of the system.
- To evolve a set of policy guidelines for integrated development of Tinsukia district of Assam.

2.3 SCOPE OF WORK:

1. The present investigation aims to evolve plausible strategies for the integrated development of Tinsukia District, Assam.
2. The investigator may employ optimal planning techniques and theories to have in depth analysis and arrive at a set of policy guidelines.
3. The investigator hopes that if the planning policy guidelines are implemented in the system in time, integrated development would be anticipated in the study area.

2.4 LIMITATIONS:

1. Limited resources for conducting the investigation.
2. Time constraints; limited time period to finish the whole project.

2.5 CONCEPT:

The investigator has employed the systems concept. A system functions as a whole with the interaction of several sub – systems. All the subsystems of the system are interlinked and interdependent on each other, and functions as a whole. If one of the sub – systems of the system, functions with advancement or defunct its effect can be observed in the whole system. The investigator considered Tinsukia District as a system. Therefore, systems concept in employed in this investigation to assess the functions of the system at

different alternative conditions to evolve a set of plausible policy guidelines for integrated development of the district.

Seven Sub – Systems of the Urban System

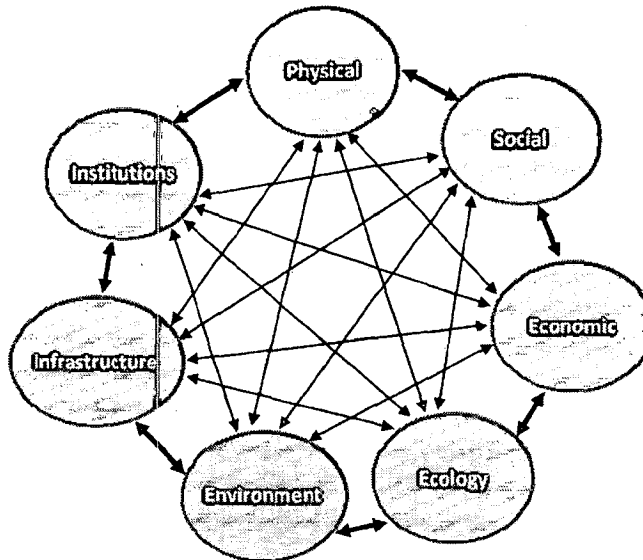


Figure 2.01: Showing Seven Sub – Systems of the Urban System

2.6 RESEARCH METHODOLOGY:

The research methodology, which is going to be followed in this investigation, is presented in Figure 2.02, and the methodology which would be used for data analysis is presented in Figure 2.03.

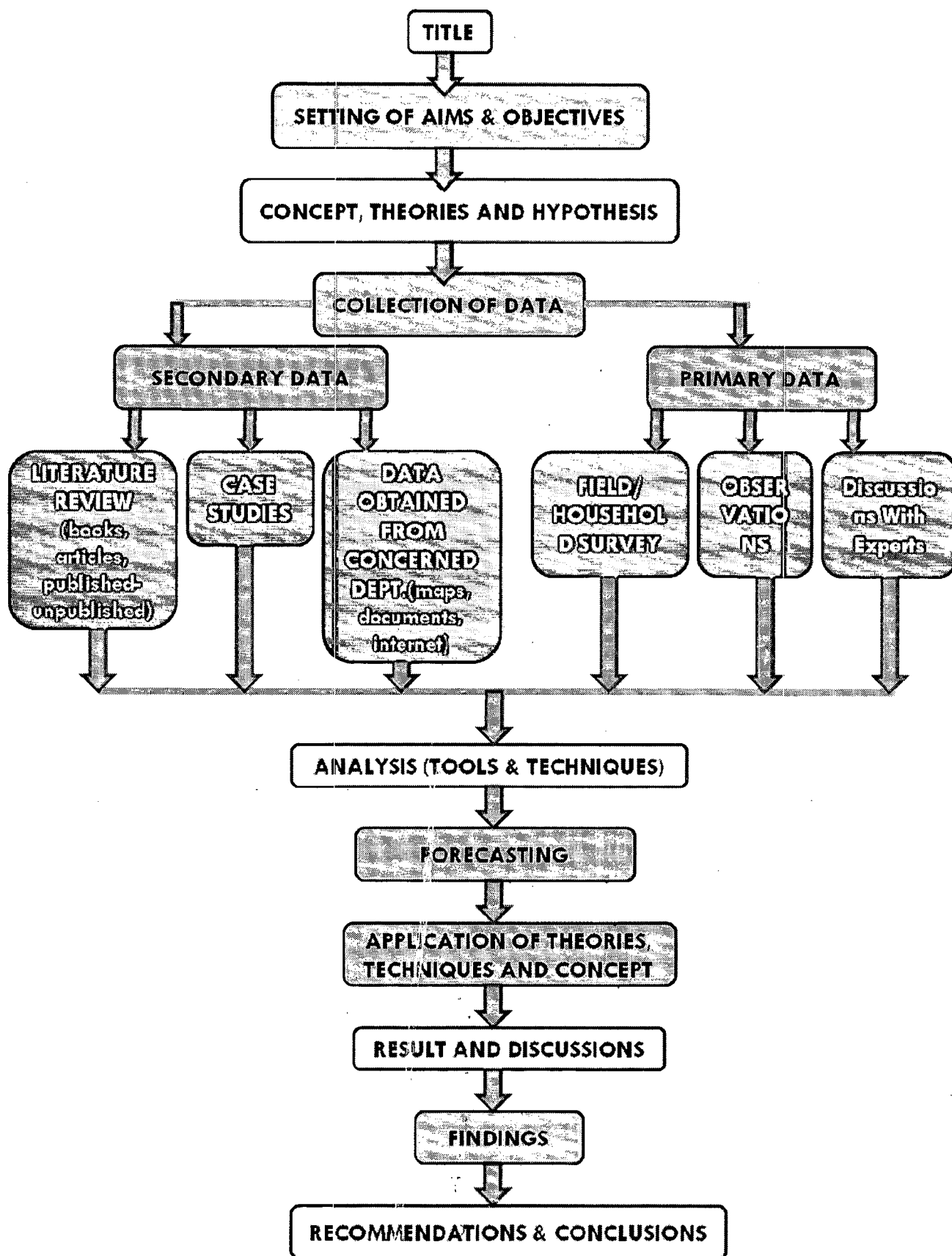


Figure 2.02: Flow chart showing the Research Methodology adopted for study

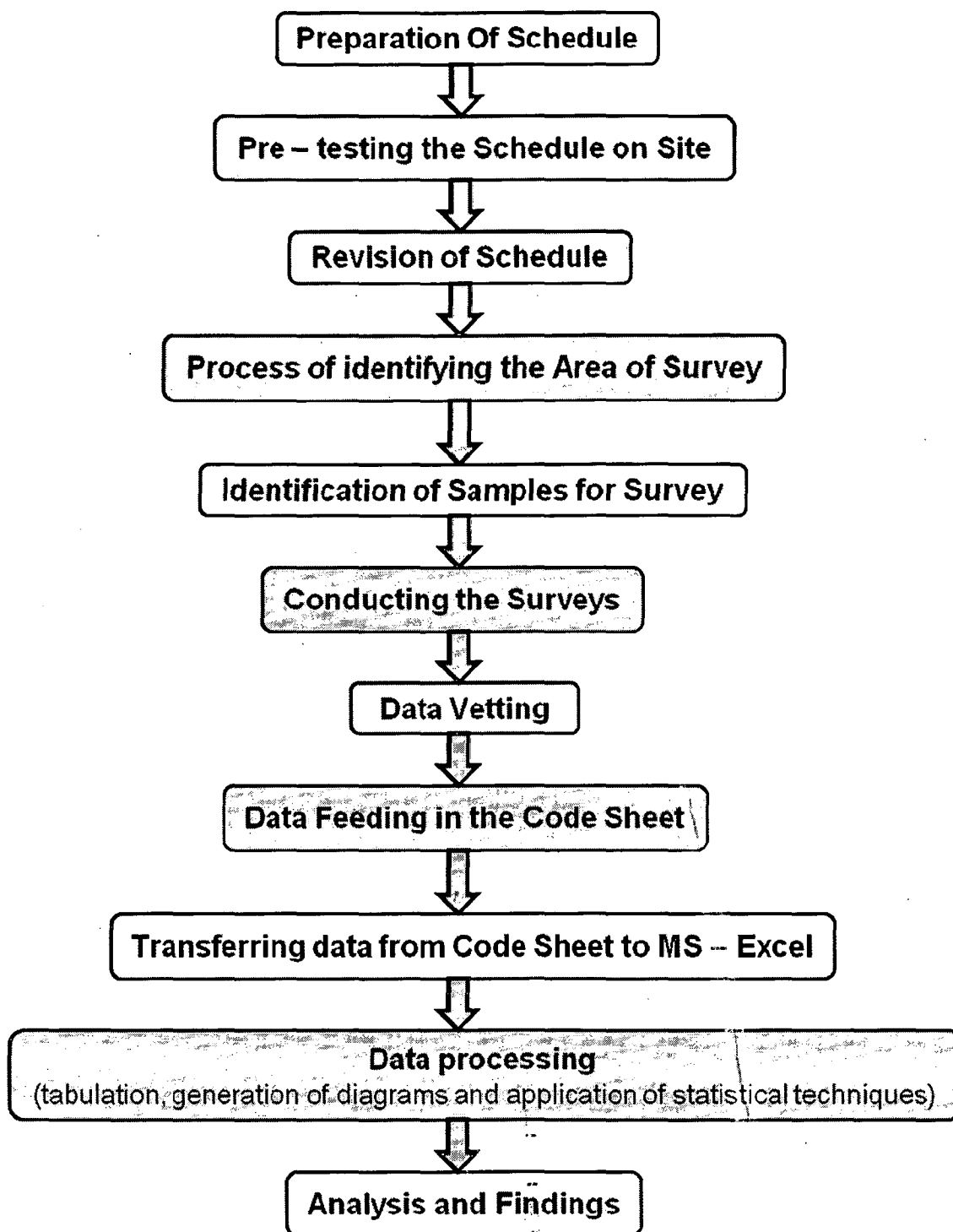


Figure 2.03: Flow chart showing the Methodology for Primary survey and analysis

2.7 SIGNIFICANCE OF THE PRIMARY DATA: Most of the secondary data was made available to the Investigator at the time of the investigation (2010 and 2011) for the district based Census-2001. However, part of data, which is documented year-wise by the concerned agencies / departments and are compiled over a period of several years of publications. The secondary source of data have a set of data, which is commonly available, whereas certain

data have more bearing at the micro level are not available in any form of secondary sources of data. Data pertaining to spatial qualities, environmental condition of the households, priorities of the households, details related garbage; drainage, income, expenditure and savings, accessibility to infrastructure services, household facilities, household appliances etc., at the micro level are not available in any form of secondary data. These data are also essential along with the available secondary sources of data to understand the functions of the system. Therefore, an extensive primary survey was attempted by using pre-tested household schedules in this investigation. This study was conducted in the current year 2011, which is considered as the base year for this study.

2.8 NEED FOR THE PRIMARY SURVEY: Integrated development plan aims at total development of the system, which requires in-depth understanding of various activities that prevail in the system, quantification resources and their potentialities, issues, etc., Primary survey is most popular device for obtaining desired data to understand the characteristic features in relations to landform, spatial, seasonal resources, population density, socio-economic activities, infrastructure facilities etc., pertaining to the study area. Development of the region is depending on changing several spatial and socio-economic factors. Therefore, the Investigator has decided to collect detailed investigation at the household level in the study area. The household survey brought lot of imminent to understand the system, the factors that influence the functions of the system pertaining to availability and consumption of natural and artificial resources, ecology, environment, etc.

The information in secondary data are in the form of published records, notes, articles, papers, books, etc & can be collected from various government departments and non-government organizations, in which the task of collecting data might be given to untrained personnel having no knowledge of survey work and the data collected could be biased which would result in incorrect data. The secondary data kept by various departments and organizations are in accordance to their own requirements, which might not fulfil the requirement of the project in the study area.

Secondary data might be too old for the project, to get the precise information for best results. To collect secondary data same survey is conducted in different locations and with different time lags, which create skewed information, while primary data is collected from different locations and at the same time, which makes it skew free.

While collecting the primary data the surveyor directly interacts with the people of study area and can draw other queries which are not part of the schedule but could be relevant and substantial in the study.

2.9 SURVEY TOOLS: Relevant survey tools, such as, schedules, questionnaires were being employed.

2.9.1 Household Schedule: Household schedule is the most important one, which is used for conducting survey at the grassroots level. This schedule has several variables related to socio-economic and environmental quality of the households in the study area. Details, such as family size, Number of employed persons, Education, Number of technically qualified person, family income, housing detail, Details of household income and expenditure, Details of water supply, electricity, drainage /sewerage, waste disposal. Details of agriculture such as cropping pattern, irrigation, livestock, rural transportation etc., were included in this schedule. The household schedule used for this investigation is presented in Appendix.

2.10 SURVEY TECHNIQUES: Random sampling technique was employed for identifying households for conducting this investigation.

2.11 ANALYTICAL TOOLS AND TECHNIQUES

2.11.1 Analytical Tools: Analytical techniques, such as, code sheets, computer hardware; software was used for data processing and analysis.

2.11.2 Analytical Techniques: Analytical techniques, such as, tabulation, correlation, etc, were employed.

2.12 APPLICATION OF STATISTICAL TECHNIQUES: Statistical techniques, such as, standard deviation, forecasting techniques etc., were employed. Analysis is also done on the basis of literature survey and the survey results.

CHAPTER – 03

**LITERATURE REVIEW AND CASE
STUDIES**

3.1 PLANNING THEORIES

3.1.1 CENTRAL PLACE THEORY: Central Place Theory (CPT) is an attempt to explain the spatial arrangement, size, and number of settlements. The theory was originally published in 1933 by a German geographer Walter Christaller who studied the settlement patterns in southern Germany. In the flat landscape of southern Germany Christaller noticed that towns of a certain size were roughly equidistant. By examining and defining the functions of the settlement structure and the size of the hinterland he found it possible to model the pattern of settlement locations using geometric shapes.

Assumptions: Christaller made a number of assumptions such as:

All areas have

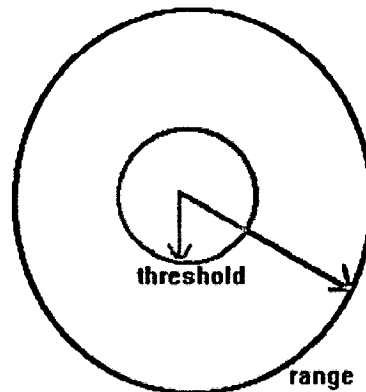
- an isotropic (all flat) surface
- an evenly distributed population
- evenly distributed resources
- similar purchasing power of all consumers and consumers will patronize nearest market
- transportation costs equal in all directions and proportional to distance
- no excess profits (Perfect competition)

Explanation of some terms: Central Place, low order, high order, sphere of influence

- A Central Place is a settlement which provides one or more services for the population living around it.
- Simple basic services (e.g. grocery stores) are said to be of low order while specialized services (e.g. universities) are said to be of high order.
- Having a high order service implies there are low order services around it, but not vice versa.
- Settlements which provide low order services are said to be low order settlements.
- Settlements that provide high order services are said to be high order settlements.
- The sphere of influence is the area under influence of the Central Place.

Details of the theory: The theory consists of two basic concepts

1. **Threshold:** The minimum population that is required to bring about the provision of certain good or services
2. **Range of good or services:** The average maximum distance people will travel to purchase goods and services



From these two concepts the lower and upper limits of goods or services can be found. With the upper and the lower limits, it is possible to see how the central places are arranged in an imaginary area.

Arrangement of the Central places/ settlements: As transport is equally easy in all direction, each central place will have a circular market area as shown in C in the following diagram:

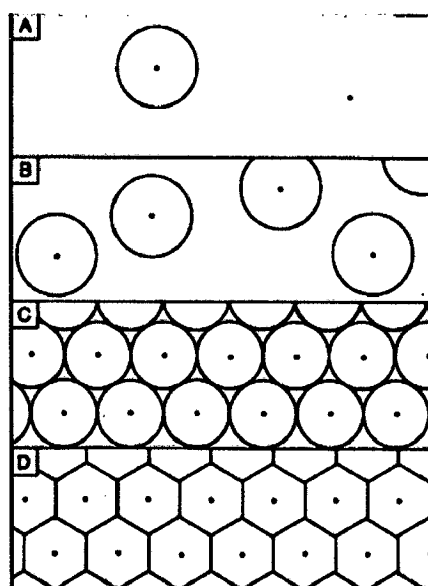


Figure 3.01: Showing Arrangement of the Central places/ settlements

However, circular shape of the market areas results in either un-served areas or over-served areas. To solve this problem, Christaller suggested the hexagonal shape of the markets as shown in D in the above diagram. Within a given area there will be fewer high order cities and towns in relation to the lower order villages and hamlets. For any given order, theoretically the settlements will be equidistance from each other. The higher order settlements will be further apart than the lower order ones.

The three principles in the arrangement of the central places: Christaller noted three different arrangements of central places according to the following principles:

1. The marketing principle (K=3 system);
2. The transportation principle (K=4 system);
3. The administrative principle (K=7 system).

1. Marketing principle: According to the marketing principle $K = 3$, the market area of a higher-order place includes a third of the market area of each of the following size neighbouring lower-order places and each is located at the corner of a hexagon around the high-order settlement. Each high-order settlement gets $1/3$ of each satellite settlement, thus $K = 1 + 6 \times 1/3 = 3$.

However, although in this $K = 3$ marketing network the distance travelled is minimized, the transport network is not the most efficient, because the important transport links between the larger places do not pass through intermediate places.

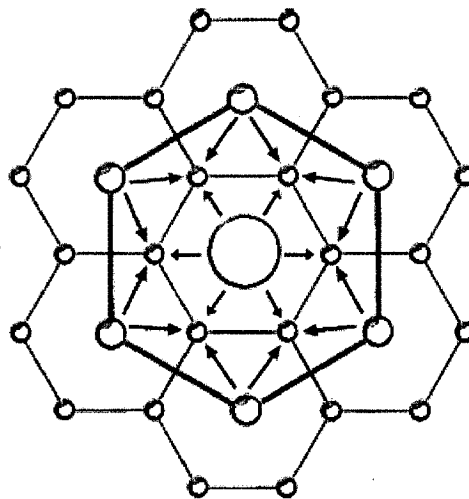


Figure 3.02: Showing K=3 principle

2. **Transport principle:** According to $K = 4$ transport principle, the market area of a higher-order place includes a half of the market area of each of the six neighbouring lower-order places, as they are located on the edges of hexagons around the high-order settlements. This generates a hierarchy of central places which results in the most efficient transport network. There are maximum central places possible located on the main transport routes connecting the higher order centre.

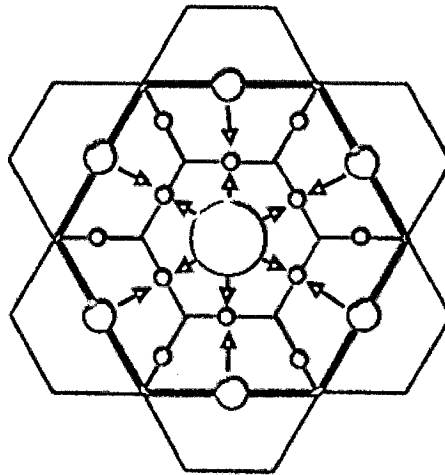


Figure 3.03: Showing $K=4$ principle

3. **Administrative principle:** According to $K = 7$ administrative principle (or political-social principle), settlements are nested according to sevens. The market areas of the smaller settlements are completely enclosed within the market area of the larger settlement. Since tributary areas cannot be split administratively, they must be allocated exclusively to a single higher-order place. Efficient administration is the control principle in this hierarchy.

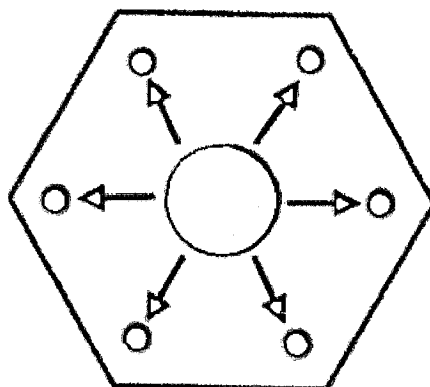


Figure 3.04: Showing $K=7$ principle

Evaluation of Central-Place Theory: The following passages are some of the evaluation of Christaller's central place theory. The pattern of cities predicted by central place theory may not hold because of the failure to meet initial assumptions.

- Production costs may vary not only because of economies of scale but also by natural resource endowments (i.e. not a homogeneous plain).
- Transportation costs are not equal in all directions.
- Rural markets (initially households) are not evenly distributed.
- Non economic factors (culture, politics and leadership) may be important but not evenly distributed.
- Competitive practices may lead to freight absorption and phantom freight (other forms of imperfect competition).

Application to Economic Development: Applying the central place theory, many studies have been done regarding to establishments and retail viability. For instance, in his article, Shonkwiler (1996) summarized important knowledge already established by other researches.

- Average transportation costs per purchase are lowered by multipurpose shopping trips.
- The consumer might find it desirable to shop at multiple locations on a single trip.
- Not only population but demographic characteristics, socioeconomic structure, potential expenditures, and shopping behaviour are the most important factors to explain spatial clustering.
- Although a major tenet of central place theory was that producers tend to locate as far as possible from competitors, firms may recognize the advantages of agglomeration and the benefit of centrality that result from adjacent location.
- The development of central places depends on factors such as transport costs, expenditure shares for relevant goods and the cost characteristics of stores.
- Planning commissions continue their efforts on industrial recruitment while the pursuit of other development strategies such as retail-sector expansion may be overlooked.

Moreover, in his statistical analysis of rural retail business, Shonkwiler (1996) concludes, "retail business interdependencies exist and minimum demand threshold values for various

retail sectors are sensitive to the presence or absence of other type of retail firms.” Additionally, in his regression analysis to rural communities, Mushinski (2002) concludes “incorporating explicit geographic interdependence between establishments in a place and sources of supply and demand in neighbouring areas” exists, and is “particularly significant on the supply side.” Moreover, “outlying establishments tend to reduce the number of establishments in a place, which underlines the importance of spatial competition in retail development.”

3.1.2 GROWTH POLE THEORY:

Need of growth pole: One reason is “failure of central place” and reasons behind spatial and industrial development are:

1. Growth does not appear everywhere and all at once.
2. It appears in points or development poles with variable intensities.
3. It spreads along the diverse channels (i.e. roads and commuting links) and with varying terminal effects to the whole economy.

BoudeVille defines a regional growth pole as a set of expanding industries located in an urban area and inducing further development of economic activity throughout its zone of influence.

The theory originally focuses on the development of growth poles in economic base, taking economic space as a field of forces, from which the notion of a pole as a vector of economic forces i.e. a field of forces consists of centre, which emanate centrifugal forces and centripetal forces are attracted to it. Boudeville extended this to include more comprehensively the geographical space

Davin in 1950 postulated that a growth pole is formed when an industry, through the flow of goods and incomes which it is able to generate, stimulates the development and growth of other industries related to it (technical polarization); or determines the prosperity of the tertiary sector by means of the incomes it generates (income polarization); or stimulates an increase of the regional economy by causing a progressive concentration of new activities (psychological and geographical polarization).

The Geography Dictionary (2004) defines growth poles as follows: “A point of economic growth”. Growth poles are usually urban locations, benefiting from agglomeration economies, and should interact with surrounding areas, spreading prosperity from the core to the periphery”.

The concepts of growth poles:

1. The concept of leading industries: This concept states that, a centre act as a growth pole because of propulsive firms belongs to leading industries which dominate other economic units. There may be just one single dominant propulsive firm or a core of several industries. The reason for their geographical location in certain points in region is due to:

- Localization of natural resource (water/shelter/fuel).
- Localization of man- made advantages (communication/labour supply).

2. The concept of polarization (Albert Hirschman uses the term *polarization*): The rapid growth of the leading industries induces the polarization of other economic units into the pole of growth. It is an adverse effect by the leading industries. The polarization effects can discourage growth in the hinterland because of these factors:

- The industries in hinterland may find it difficult to compete with the leading industries in growth pole particularly as transportation facilities are improved.
- As there are better investment opportunities in the growth poles, the investors in the hinterland may invest their savings in the growth pole rather in the hinterland.
- At last, it might drain of the best parts of its labour force. The growth pole may denude the hinterland of its key technicians and managers and the young men.

A polarized region has been defined as a set of neighbouring towns exchanging more with the regional metropolis than with other cities of the same orders in the nation.

3. Polarization effects and agglomeration economics: Once localized, the propulsive firms within the leading industry tend to grow rapidly reaping the advantages of

agglomeration economies and effecting the polarization of other economic activities around the original location. Types of agglomeration economies:

- **Economies internal to the firm:** These are lower average production costs by increasing the rate of output.
- **Economies external to firm but internal to the industry:** In this there is reduction in cost per unit of output by expanding the industry at a particular location.
- **Economies external to the industry but internal to the urban area:** These downward shifts in the average cost of each firm are due to grow up of many industries in one place.

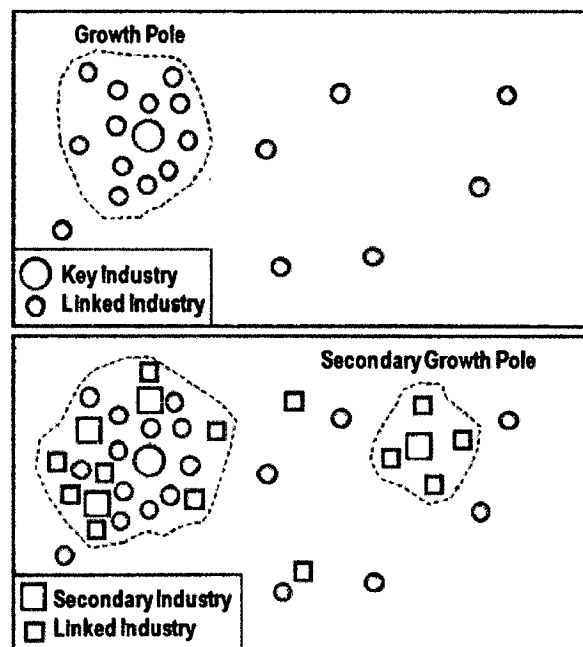


Figure 3.05: Showing Growth Pole Theory

4. **The concept of spread effect:** The concept of spread effect: this term is also used by Albert Hirschman as the positive forces by the leading industries. The dynamic propulsive qualities of the growth pole radiate outwards into the surrounding space. Such forces work basically through

- Inter-regional trade

- Transfer of capital to backward areas.
- And in addition it might attract labour from backward areas relieving it from population pressure.

5. Growth pole theory and regional planning: The theory is particularly attractive as a policy tool for several reasons:

- Owing to the various agglomeration economics it tends to be a very efficient way of generating development.
- The concentration of investment in specific growth points costs less in terms of public expenditure than wholesale grants to large areas.
- The spread effects out of the growth point will help to solve the problems of depressed regions.

6. Growth poles and growth centres (Waheeduddin Khan): In the regional development concept the localization of development/growth elements at a selected point in a given space is the solution for regional development and reducing economic disparities with in a region and amongst different regions. This development concept has two broad categories:

- The structure of space.
- The nature of the development process

The structure of space is defined by three identifiable ordering principles

- Distribution of population along a size continuum
- Distribution of settlements by size of population and distance
- The number and type of functions performed by settlements of different sizes. Each of these settlements has its zone of influence (field of forces) and this influence varies directly with the size of the concentration of functions and inversely with the

time- distance friction involved in movement to/from the core/periphery. A growth pole can be defined as localized growth elements set in a heterogeneous continuous area. The impact of localized growth impulses on the contiguous area will depend on the efficiency with which the mechanism through which growth impulses are transferred from one point in space to other lower order point, this is known as spread effect. The process of growth has two ways:

- Growth as a result of innovative activities of firms which are themselves large and have the capacity to influence production decisions of many other smaller dependent firms.
- Growth is a result of the external or trade relations of production units located in a region and as local factor incomes in a region; the multiplier process adds further momentum to the growth trend.

In simple words a growth pole would be a higher order centre containing many large industries (industrial complex). The policy of growth centres in the Indian situation is concerned more with the development of areas rather than with their rate of growth.

7. Growth pole approach:

- Growth centres could sustain only on the basis of their growth characteristics. Identification of growth centres, services/activities holding by them and providing the facilities and activities is not the total process of integrated rural development.
- The need is to make detailed studies on land use planning or on soil analysis, the depth of water level, fishery development and the geological material for activities connected with industrial development.
- The creation of growth poles envisages the concentration of growth in selected centres for the proper establishment of propulsive industries. These poles would be able to radiate the growth impulses in the surrounding regions for generating the spread effects in its economic space. The growth centre strategy seeks to

The objective of district planning is to arrive at an integrated, participatory coordinated idea of development of a system. An essential step in this direction is to ensure that each Panchayat at any level or Municipality is treated as a planning unit and the 'district plan' is built up through consolidation and integration of these plans as well as by considering the development of the district as a whole.

3.2.1.1 Hierarchy of Planning Regions: Planning limit corresponds to the degree of economic viability and the scale of major development in the area. The planning regions can thus be classified by combining areas of homogeneity according to the purpose and scale.

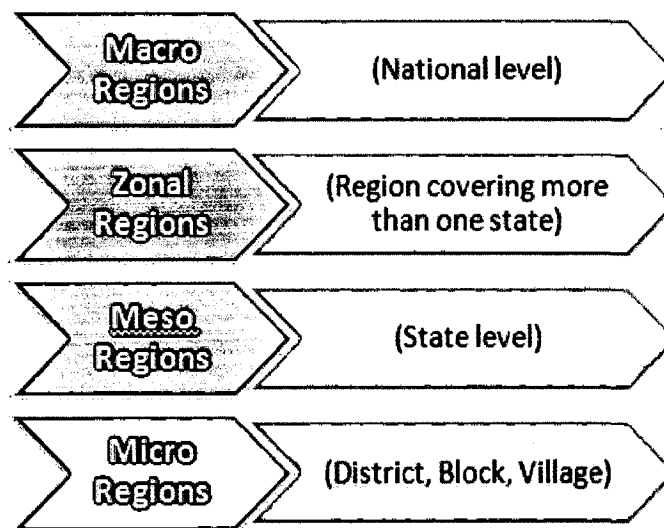


Figure 3.06: Showing Hierarchy of Planning Regions

3.2.1.2 Micro Level Planning:

- According to K. L. Narasimha Murthy, "Micro-level planning refers to the preparation of a plan for development of smaller areas, such as District."
- According to Lalit K. Sen. "Micro-level planning is a dynamic process and involves planning at the grassroots level taking each individual, family and category of the community of a hamlet or village, as the basic unit of planning and forum to analyse their situation critically and understand the power relations existing in every sphere: political, socio-economic and cultural".

The village is perhaps the ideal unit for the preparation of micro-level plans. Distinction has to be made among local, regional and national levels of planning and they have to be spatially integrated. In order to bring development at the grassroots, planning will have to necessarily start from the bottom instead of the top.

Planning of Micro-Level Units: If micro level units are properly planned, they help in the maximum utilization of resources. Further, these potential units help to support the rural poor at the village level. This in turn curtails the rural-urban migration and congestion in the urban areas.

Objective of Micro-Level Planning

1. The main objective of micro-level planning is to achieve integrated development at the national level.
2. It deals with the hierarchic pattern of preparation of plans for integrated planning.
3. The central villages, service centres, growth centres and the regional cities will be interconnected with roads, fast moving transport, telegraph, telephone lines and other means of communication.
4. Preparation of guidelines for the location of services and other infrastructure facilities at various levels.
5. Allocation of funds and other economic investments at various levels of the hierarchy.

3.2.1.3 Integrated Area Development: Integrated area development refers to the integration of two types of integration- functional and spatial, which are themselves interrelated. Functional planning relates to the integration of all economic and social activities which influence the life of the people like health, education, agriculture, industries and several other aspects of day-to-day life. Spatial planning is a kind of physical planning which depends upon the availability of electricity, transportation system, water resources, mineral resources and the like in an area.

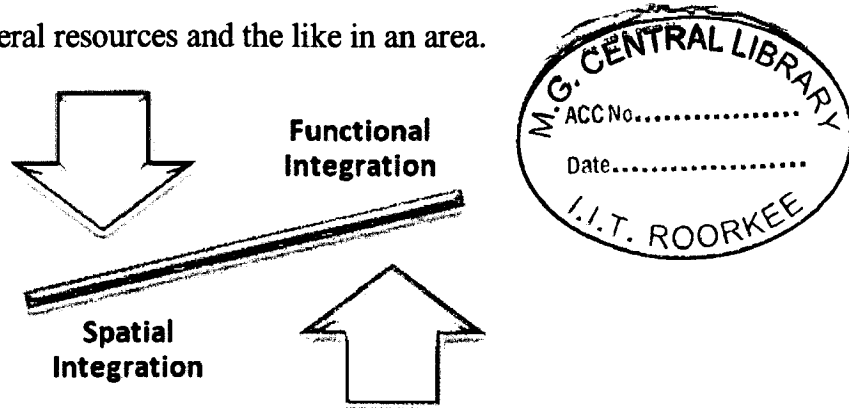


Figure 3.07: Showing Integrated area development system

3.2.2 PLANNING PROCESS AT DISTRICT LEVEL: As regards district Panchayats, the role would be one of preparing plans in accordance with activity mapping and overall coordination in planning, providing capacity building and technical support, to lower levels of panchayats. The District Panchayat has the responsibility to provide for equitable development of backward regions within the district. This could be done through guidelines as well as differential allocation of resources to low levels of panchayats under special component plans and programmes in the earmarked fund. The District Panchayat plan also looks into several issues that may lie outside activity mapping, but are critical to the overall development of the district as a whole.

3.2.2.1 District Planning Committees: Planning for economic development and social justice is a mandated function of local governments and the District Planning Committees (DPC) has a crucial role to play in the process. Under Article 243ZD of the Constitution of India, a District Planning Committee shall be constituted at the district level in every State to consolidate the plans prepared by the Panchayats and the Municipalities in the district and to prepare a draft development plan for the district. The Constitution therefore enjoins upon the DPCs two specific responsibilities. In preparing the draft development plan, the DPC shall have regard to matters of common interest between the Panchayats and the Municipalities including spatial planning, sharing of water and other physical and natural resources, the integrated development of infrastructure and environmental conservation and the extent and type of available resources, both financial and otherwise.

3.2.2.2 Status of DPCs at Present: All States and Union Territories except Meghalaya, Mizoram, Nagaland, J&K and NCT of Delhi are required to set up District Planning Committees in accordance with Article 243ZD of the Constitution of India. Bihar, Chhattisgarh, Goa, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Orissa, Rajasthan, Sikkim, Tamil Nadu, West Bengal and the Union Territories of Andaman and Nicobar, Dadra and Nagar Haveli, Daman & Diu and Lakshadweep have constituted District Planning Committees in all districts. Manipur has constituted DPCs in four Valley districts. District Planning Committees have not been constituted in Jharkhand and Pondicherry.

Table 3.01: The current status of DPCs in States is as follows

Sl. No	States/Union Territories	Status of constitution of DPCs
1	Andhra Pradesh	Not yet constituted.
2	Arunachal Pradesh	Not yet constituted.
3	Assam	Not yet constituted.
4	Bihar	Constituted in all 38 districts. Chairman ZP is the Chairman of DPCs.
5	Chhattisgarh	Constituted. Minister is Chairpersons of DPC
6	Goa	Constituted. President of ZP is the Chairperson of DPC
7	Gujarat	Not yet constituted.
8	Haryana	Constituted in all 19 Districts.
9	Himachal Pradesh	Constituted in 12 districts. Minister is Chairperson of DPC.
10	Karnataka	Yes. In all Districts. President, ZP is Chairman of DPC.
11	Jharkhand	Panchayat Elections yet to be held.
12	Kerala	Yes, Chairman of District Panchayat (DP) is Chairman of DPC.
13	Madhya Pradesh	Yes. District in-charge Ministers are Chairpersons.
14	Maharashtra	Not yet constituted.
15	Manipur	Yes in 4 districts. Adhyaksha, DP is Chairperson

With the 73rd and 74th amendments [2] of the Constitution of India, decentralization of planning is emphasized and the methodology of district plan was changed. The approach suggested for the preparation of the district plan is as follows:-

1. Steps in district planning
2. District visioning
3. Block vision
4. Plan for grama panchayat/municipality
5. Plan for block panchayats
6. District plan
7. Integration of entire local plans
8. Summary of district planning methodology

3.2.2.3 Steps in district planning: The sequence in the preparation of district plan can be as follows:

- Preparation of district vision, block vision and gram panchayat level vision.
- Preparation of participatory plan involving Gram Sabha from Gram Panchayats to Zilla Parishad.
- Preparation of plans by Urban Local Bodies.
- Consolidation of plans prepared by local bodies by District Planning Committees.
- Planning starts with the preparation of vision documents by local bodies.

3.2.2.4 District visioning: A vision document is for 10 to 15 years is to be prepared by the district and for each local government based on a participatory assessment. The DPC may hold formal interactions with local governments and other key stakeholders on this and then finalise it. The document should clearly identify the key reasons for backwardness / development shortcomings and address issues impeding development. District vision document will cover:-

1. Agriculture and allied sectors.
2. Availability and development of water sources.
3. Industries – especially traditional, small industries including food processing.
4. Infrastructure including power.
5. Drinking water and sanitation.
6. Literacy, school education.
7. Health and medical facilities.
8. Poverty reduction and basic needs.
9. Gender and children.
10. Social justice – SC / ST, Persons with disability etc

3.2.2.5 Block vision: A vision document for the block will be prepared with some modifications based on the conditions of the block. The vision document for each block need not be completely different because the agro-ecological conditions of some planning units at this level may be same. Even though the same vision is adopted for some blocks, it is necessary to have the vision owned by the Intermediate Panchayat. This exercise will be done by a team of experts at block level. The same team will be responsible for plans at the GP level. The general formats for planning at the lowest unit level viz., GP or ULB will be prepared at the district level and they will be adopted with certain modifications at the block level. Vision of the Gram Panchayat will also be prepared accordingly. The vision of the GP will be based on the Socio-economic Profile of the GP and views of the GP.

3.2.2.6 Plan for gram panchayat/municipality

- The plan at the GP or ULB will be prepared with the help of people's participation.
- Once the Gram Panchayat vision is approved, the team will conduct several Group Discussions to find out the potentials, needs and constraints of the village economy in Gram Sabha.
- The felt needs of these communities and the support needed for improving their livelihood conditions will be elicited.

- The plan should also take into account the long term development perspective of the GP and also Natural Resource Management (NRM) aspects.

3.2.2.7 Plan for block panchayats: The above three steps followed the top down approach in the preparation of the district plan. After this GP Plan is prepared and no plan is ready at higher levels except the vision. The Plans at the higher levels will be prepared in the next steps. In this step, the GP plans will be consolidated and put before the IP. In the GP plans, the benefits of some of the schemes will go beyond the GP and such schemes may figure in the other GP plans also. Hence, they have to be separated and duplication has to be avoided. Similarly, some schemes which provide benefits beyond the GP level may not be identified in any GP. The Block Plan has to identify those schemes / projects. This exercise will be done at the meetings of the Intermediate Panchayat level.

3.2.2.8 District plan: The final stage is the preparation of the district plan. This will be finalized after the Block Plans are finalized in the same way as the Block Plan is finalized on the basis of the GP Plans in the Block. The schemes that will not figure in the Block Plans, but are essential for the development of the district will be identified at this stage. Further, an attempt will have to be made to achieve functional and spatial integration and use the norms for the provision of social infrastructure. The above five steps will help in the preparation of the perspective plan. To work out the annual plans, the financial resources available have to be taken into account. The local government component of the District Plan would emerge out of the resource envelope containing the following sources of funds:

- Own resources available for development
- Transfers by State Finance Commission for development purposes
- Twelfth Finance Commission grants passed on by the State Government
- Untied grants for local planning
- Grants in respect of Centrally Sponsored Schemes.
- Grants for State Plan schemes assigned for implementation through local Governments

- Grants for externally supported schemes assigned for implementation through local governments
- Estimated contribution by the communities themselves

3.2.2.9 Integration of entire local plans: In the realization of the district vision, district plans will need to put together resources channelized from all sources including district segments to the State Plan, CSSs, Special Programmes such as Employment Guarantee, Sarva Shiksha Abhiyaan, Rural Health Mission, Grants-in-aid for specific purposes from Finance Commission, Bharat Nirman etc. Therefore consolidation is a task that goes much beyond compilation and connotes a degree of value addition through integration of local plans. There are several aspects of integration of plans that have to be considered in the preparation of the draft development plan.

3.2.2.10 District Planning Methodology:

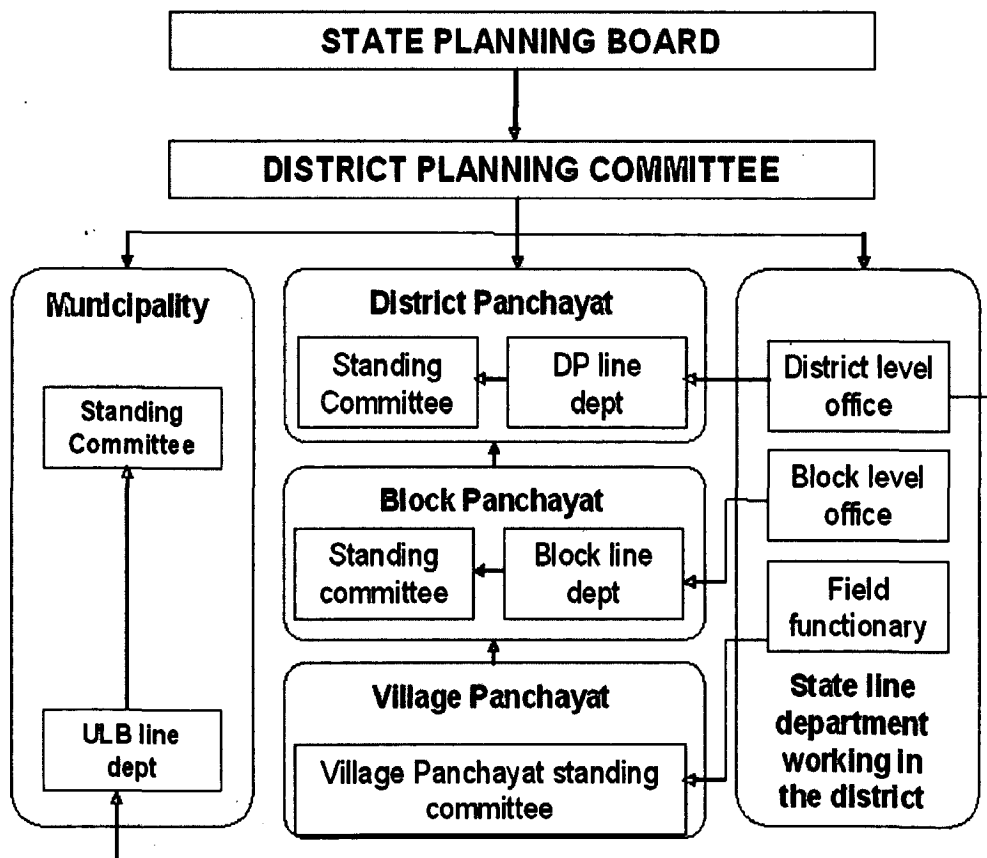


Figure 3.08: Showing District planning methodology

3.2.3 TEN STEPS TO SUSTAINABLE INFRASTRUCTURE: CHARLES L. CHOGUILL [1996], the author made an attempt to achieve the sustainable infrastructure, particularly water supply, sanitation, drainage and solid waste management. Good number of literature had been reviewed by the author with respect to water supply, sanitation facilities, drainage, urban roads, solid-waste disposal facilities, land management on the basis of existing situations of various cities. The author developed a model for the progressive improvement to a conventional standard of urban infrastructure in a sustainable manner, paying particular attention. The investigator opined that the development of an adequate infrastructural base in urban areas is a prerequisite to the achievement of urban sustainability. Simplistically, infrastructure can be divided into two components. The first of these is social infrastructure, including educational and health care facilities. The second category, which forms the core of this research study, is physical infrastructure, including water supply, sanitation facilities, drainage, urban roads, solid-waste disposal facilities and land management. These include what the World Bank refers to as "the long lived engineered structures, equipment and facilities, and the services they provide which are used in economic production and by households". The author had developed a sustainable model for the progressive improvement of infrastructure with ten guiding principles. They are:

- 1. It must be recognized that within all cities in the developing world, two inter-dependent circuits exist, the formal and the informal.*
- 2. It must be recognized that the town system of infrastructure, that which is based on conventional technology, should be operated by either a municipal authority or a private firm nominated by that municipality, on a full cost-plus recovery basis.*
- 3. Irregular land tenure issues should be resolved within the informal residential sectors of the city.*
- 4. Informal infrastructure should be designed and built using external technical assistance as required, to be upgradable from a basic standard to that which can be incorporated, with time, into the town system.*
- 5. Informal infrastructure built by the local community should be under its control.*
- 6. The technology adopted for informal-sector infrastructure must be maintainable by the community.*

7. *The informal structure must be affordable by its low-income users.*
8. *Informal-sector infrastructure must be socially acceptable to the community involved.*
9. *In order to achieve city-wide coverage of infrastructure, including within the informal residential sector, it is necessary that government adopt the role of facilitator and enabler rather than merely as provider.*
10. *Non-governmental organizations can play a key role in assisting communities to develop infrastructure systems.*

The overall conclusion of the study is that a shift is taking place in the way that the role of the local community must be seen with respect to infrastructure. Increasingly, multilateral organizations are shifting priority from the neighbourhood to higher levels. Till today the environmental concerns and sustainability arguments are great challenge to city administrators. As a result, governments, non-governmental organizations and communities must all work together to design systems that can be built locally and operated and maintained by the community, and yet which can be upgraded from on-site and community standard to the generally accepted conventional town standard. Further the study concludes that the sustainability can be achieved overnight, yet should constitute a target for future development. In order to achieve this, local communities will require considerable assistance and support from agencies and organizations at all levels. Yet without this, environmental standards will continue to deteriorate, mortality rates will continue at a high level and acceptable standards of living will continue to remain elusive for low-income groups.

3.2.4 PLANECO - Planning in Ecological Networks: Piergiorgio BELLAGAMBA [2000], PLANECO is a research project founded by the Italian Ministry of University and Scientific Research in the years 1998–2000. The author chosen Italy and made attempt to understand the national ecological network. In Italy the interconnection between the natural and cultural systems, together with the overlay of a national ecological network, interacts at all levels of planning and land use transformation. The author studied the Planeco Project and suggested some possible solutions for this problem in three ways:

1. In the first case, ‘dynamic indicators’ will be used to determine the present situation and possible scenarios. Among these indicators are settlement dispersion,

infrastructure density and permeability, and spatial and quantitative relationship between natural and urban land use.

2. In the second, the new consideration of a ramified zone structure of protected areas takes the place of the old consideration of a centralized zone structure. This allows a better environmental continuity between the inside and the outside of the parks, and supports an eco-centric planning process to be tested in areas of special environmental protection.
3. In the third, town-planning principles like linear urban development are reviewed because they fragment environmental continuity and threaten the quality of nature.

The investigator considered the important parameters such as bio-permeability, the major units of environmental continuity, Environmental systems and landscape units, Environmental fragmentation of infrastructural and urban barriers, Potential zoological diversity and Geography of social morphologies and carefully analyzed. It has been observed by the author that the development of ecological networks in Europe and, particularly, in Italy should be carried out incorporating cultural aspects into the features of an ecological network and, in turn, considering the interaction between its natural and cultural components. Socio-economic trends and functions of the site should be taken into account, linking ecology to environmental economics. Then, the integration of ecological networks into the planning system becomes imperative.

The author concluded that wider landscape context should be used in the development of ecological networks, including human processes that have shaped the landscape and its natural and cultural components. The wider public policy context can be addressed in parallel, with the goal of balancing nature conservation with sustainable development. Further, this assumption emphasizes how ecological networks, in areas of ancient human occupation like Italy, are located between nature and culture. Finally the author stressed this reason the planning of future landscapes in these areas should imply not only ecological and natural aspects, but also cultural, social, economic and political considerations.

3.2.5 GROWTH CENTRE AS STRATEGY FOR RURAL DEVELOPMENT, INDIAN EXPERIENCE: In the 4th five year plan (1969-74) a scheme known as

pilot research project for growth centres was launched. This project is to identify the existing growth centre and their potential for further development.

The accent of this project was on rural-urban integration i.e. the integration of the lower order settlements with the higher order settlements for the integration of activity in economic space of region. An economic system works efficiently when appropriate marketing and transport linkages are established. Proposing and locating the missing infrastructure is a vital exercise for the regional spatial planning. The location based activities identified as the minimum activities required around the growth centres are:

- Elementary education for children up to 14 years of age.
- Minimum public health facilities integrated with family planning and nutrition for children.
- Rural water supply
- Home sites for landless labour
- Rural roads
- Rural electrification

The main aim of study is to collect the socio economic data on the human and material resources of a given ecological area. This collected information will further help in analyzing the:

- Capacities or threshold
- Present norms of use
- Present tributary areas and populations
- Present travelling time/distance norms
- Quantity and specific location of unmet demand
- Gaps and deficiencies in the provision of each function or service facility.

The information was collected in three main stages:

1. Collections of information through block questionnaire for the whole group of villages lying within the community development block boundaries.
 - Under this district study map, block study maps and study area maps were prepared to indicate general land use, administrative boundaries, location of villages and towns,
 - Location of facilities such as market, banks, education, health and recreation facilities.

LITERATURE REVIEW AND CASE STUDIES

- Transportation maps indicating all weather and seasonal roads, and cart tracts in respects to each habitation.
2. Another stage is the village questionnaire and the household questionnaire formed the core of the data collection exercises.
 3. The last was the data collection through industry questionnaire, cottage industry questionnaire and shopkeeper Questionnaire.

On the basis of collected data 20 growth centres were selected to examine their potentialities. The growth centres were:

Table 3.02: Showing the growth centres of various States

State	Name of Growth centre
Andhra Pradesh	Phirangipuram
Assam	Panitola
Bihar	Turkaulia
Gujarat	Talala
Haryana	Thanesar
Kerala	Athiyannur and Nemon
Madhya Pradesh	Sehore
Maharashtra	Basmat
Maharashtra	Seloo
Meghalaya	Bhoi
Mysore	Harihar
Orissa	Aska
Punjab	Chamkaur Sahib
Pondicherry	Pondicherry
Rajasthan	Suwana
Tamil Nadu	Namakkal
Tripura	Bisalgarh
Uttar Pradesh	Ghazipur
Uttar Pradesh	Kadipur
West Bengal	Memari

The data collected was:

1. Location, geographical area and population
2. Three tier hierarchy: the villages, large size village (2000+ population) and towns (5000+ population)
3. Per capita income, incomes originating from various sectors
4. Density of population, net sown area, area irrigated, proportion of town population to the total population, rate of change in decades
5. Number of villages where specified functions were present or absent
6. Population and number of facilities offered by each town in all the 20 growth centres.

Rural development through growth centres: Growth as a concept, 5,265 development blocks had been created in various states and union territories. The headquarters of the block development officer is a focal point of communication of various development programmes including those also which are administered by other departments. These communities have strong linkages through which they sustain and develop their effectiveness in the sphere of socio-economic activities. Rural development is a process, through collective efforts, aimed at improving the well being and self realization of people living outside the urbanized area.

Limitations of Christaller's theory in Indian context: The theory evolved by the Christaller has become a powerful guideline for assisting the welfare of weaker sections of the community But the assumptions made by the theory have some limitation:

1. Geographical space of the areas under study is no uniform: It has barriers such as rivers, hill, forests, etc.
2. The Guttman scale also brings out quite vividly the absence of bus stand, railway Station, etc.
3. The absence of an idealized hexagonal arrangement of central places.

3.2.6 CENTRALIZED AND DECENTRALIZED PLANNING (K. N. DUBEY AND R.R. SINGH)

Reason for Decentralization: The view of Ambedkar discarded the village's darning as nothing but a sink of localism, a den of ignorance and narrow mindedness. Pt. Nehru believed that innovative basic industries are essential base of Indian development. This necessitated a macro approach with centralized planning. At the time of independence country was based on Indian army, the civil administration and the Indian congress. All these institutions have renowned tradition of disciplined centralized functioning. The theory of Indian planning in practice was remained a centralized planning where only one agency of planning worked, i.e. Planning Commission.

Beginning of Decentralization: It was observed that plan formulated and goal set by a distant planning agency, the Planning Commission, do not conform to local situation where plan is implemented. Problems and realities more pressing at macro level may be less significant at local level and conversely Gie local problems may remain unseen at macro level. The most desirable and effective measure for the removal of regional disparities would be the utilization of local resources and local wisdom that needed micro-level or grass root approach to the planning.

Unit of decentralized planning: The basic criteria in the determination of planning units are the unit should be homogeneous, viable and efficient for the planning purposes. The units discussed for decentralization planning were: Division, District, Tehsils, Blocks, Nyay Panchayat, Central Villages and Villages.

District as planning units: Reasons for taking district as planning unit are:

1. It is the highest tier of the local planning introduced under the Panchayati Raj system to enlist the people's participation in development and planning.
2. It is local implementation unit of various central and state sponsored development programmes.
3. It is synonym of government for an illiterate backward Society of rural India.

4. It is lowest hierarchical unit at which most of the development departments have their own administrative machinery to work.
5. It is also a unit where the boundaries of administrative, judicial, revenue and development functional units are conterminous.

3.2.7 CONCEPT OF DECENTRALIZED DISTRICT PLANNING (P.N. SHARMA):

District planning arises from the need to supplement the national and state plans with a more detailed examination of the resources, problems and potential of local areas, it implied evolving a developmental scenario at the district level consistent with the specific needs of the people, the growth potentials of the area and budgetary allocations available. It is easy to co-ordinate between different authority in the district planning as they all in same jurisdiction and government.

Several programmes (Command Area Development Programme, DPAP, tribal area development, etc.) were initiated under the decentralized district planning for achieving the well distributed growth.

Need for spatial planning:

The spatial planning exercise at the district level would take into consideration the physical resources, land uses and all human settlements in a district from the smallest settlement to the sprawling cities. It is also concerned with the flow of people, goods, resources, and communications which is required for the planning levels of economic and social activities in the area. The spatial planning has great significance as most of the sectoral programmes require the locational decisions. The socio-economic infrastructure provisions were covered under the MNP and for delivery of inputs under the schemes of IRDP locations are required to identify. The important tasks performed by the spatial planning:

- To identify the requirement of support infrastructure to improve the quality of life and to promote the economic activities.
- To identify and correct imbalances in availability of infrastructural facilities.

3.3 CASE STUDIES:

3.3.1 DISTRICT PLANNING OF KOLLAM DISTRICT, KERALA: History of district planning in Kerala did not show any promising growth pattern. But there were many attempts started with sincerity and ended without any worthy output, all those attempts were good learning examples worthy of learning the bottlenecks.



Figure 3.09: Showing Political map of Kerala

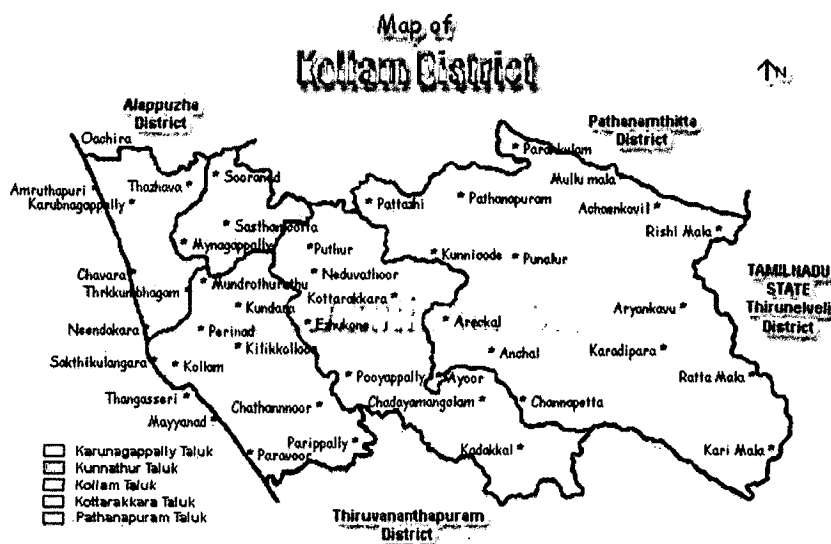
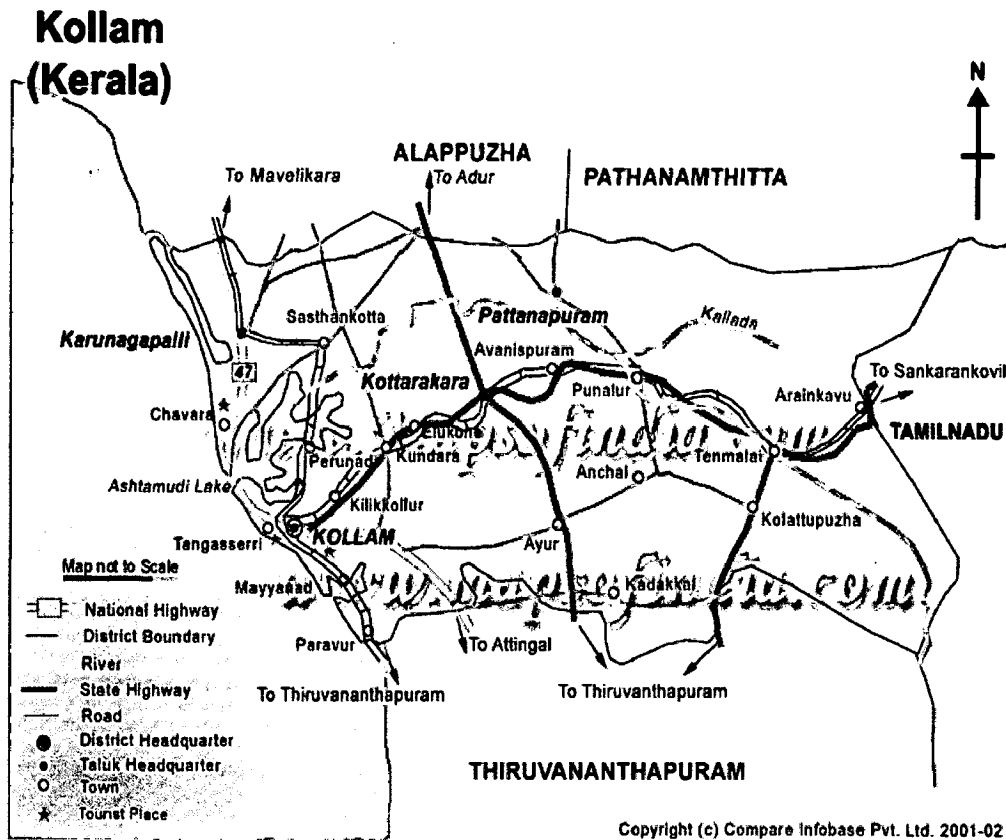


Figure 3.10: Showing Map of Kollam District



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Figure 3.11: Map Showing Road network of Kollam District

General Information	
District Area :	2491 Sq.Km.
District Population :	25,84,118
Climate :	Tropical
Rainfall :	270 Cms. (Annual)
Mean Max.Temperature :	36.0 Deg.C.
Mean Min.Temperature:	22.4 Deg.C.
Clothing :	Tropical
Tourist Season :	August to March

Figure 3.12: Showing General Information of Kollam District

Kollam District is situated on the South west coast of Kerala. The District is bound on the north by Alappuzha and north east by Pathanamthitta Districts on the east by Thirunelveli District of Tamilnadu, on the South by the Thiruvavanathapuram District and on the west by Arabian Sea.

3.3.1.1 EARLY INITIATIVES: Bringing out a district plan document giving district wise break-up of the annual plan began in the late 1960s and early 1970s. That could be the first event in the lineage of district planning exercise in Kerala. Each department prepared district-wise break up of schemes divisible among districts. That district-wise break-up of schemes has been consolidated into a single document by the Kerala State Planning Board for better monitoring of the State Plan at the district level. There was neither any sort of district planning nor any attempt for integration of sectoral schemes at the district level during the period. Those district plans were mere compilations of departmental or similar programmes into a single volume. They were useful for coordination and monitoring, but do not deserve the status of district plans.

In 1976, a District Planning Unit was set up in the Kerala State Planning Board. Later, it was transformed into Decentralized Planning Division in the State Planning Board. In the year 1979, the district planning offices were set up in all the districts except in Wynad.

3.3.1.2 KOLLAM DISTRICT PLAN: The District Planning Offices in Kerala were entrusted with the task of creation of database for each district, by compiling all available secondary data. Kollam district conducted a resource potential survey and went ahead with district planning as a pilot project with focus on industrial sector.

A District Planning Committee was set up with District Collector as Chair Person to formulate the district plan. District Development Committee (DDC) - an advisory body of officials and non-officials including the MLA's and MPs in the district, headed by the District Collector and was expected to function as the local planning machinery in the district. The dormant gram panchayats and municipalities were the existing elected local governments below the district level. Eleven technical committees were constituted for each of the major development sectors. Block Planning Committees (BPCs) were formed at every block consisting of the Chair Person of the Block Development Committee, Presidents of all the Panchayats in the block area and officials of different development departments of the concerned blocks.

The district planning exercise in Kollam district was divided into two stages:-

Stage I: - Assessment of resource endowments and the development potential of the district which included:-

Identification of local natural resources

Survey of infrastructure, and

Review of development of different sectors and ongoing schemes in the district

Stage II: - Preparation of the district plan by involving people's representatives and local government officials.

The District Development Committee (DDC) had set up the planning bodies, BPC meetings were convened and the planning procedures were explained to all actors. Panchayats were requested to discuss and decide their resource endowments, identify development problems, the schemes and projects to be included in their plan and to involve the experts available locally in the execution of the process. Panchayats were able to complete the tasks in two/three meetings. The BPC met again after a month to review the proposals from the Panchayats. They reviewed, modified or supplemented the projects to make them complete or perfect and transmitted those plans to the technical committees at the district. The technical committees held several rounds of discussion to make them conform to the standards of the state level schemes. New proposals were then formulated by the technical committees, whenever needed. The strategies for development of the sector were also evolved by those technical committees.

The procedure evolved in this experiment formed the basis of the guidelines for preparation of district plans by Kerala State Planning Board later. The Seventh Five-Year Plan visualized decentralization of planning process from the State-level to the level of districts in the first phase, and then further down to the block level, to increase the effectiveness in implementation of the anti-poverty programmes and to ensure balanced regional development. So the Planning Commission suggested the State government to formulate comprehensive district plans in two or three districts as an experiment.

3.3.1.3 MODALITY OF THE PROCESS: As per the guideline, the exercise of district planning had to start with a resource survey and preparation of a resource inventory based on secondary data as well as through primary survey for both natural and human resources. It was followed by an assessment of the felt needs of the district and formulation of a set of priorities consistent with the State and National priorities. After that, an assessment of the financial resources covering 'untied funds', flowing to the district from state and central schemes as well as the institutional finance, has to be made.

The guidelines suggested for the preparation of a perspective plan that should show the long-term development needs and the development potential of the district. The next step was to draw up five-year and annual plans. Such district plans were then to be integrated with the State Plan. The guideline suggested an effective monitoring mechanism at the district and the State level to monitor the implementation of the district plan, in terms of finance, physical achievements and devolution of appropriate administrative / financial powers and preparation of district budget. The last item in the nine-point guideline envisaged "involving Panchayat Raj Institutions and enlisting the co-operation of the voluntary agencies in the process of decentralised planning".

3.3.1.4 PLANNING METHODOLOGY: The methodology adopted for the planning of Kollam district, Kerala is described below.

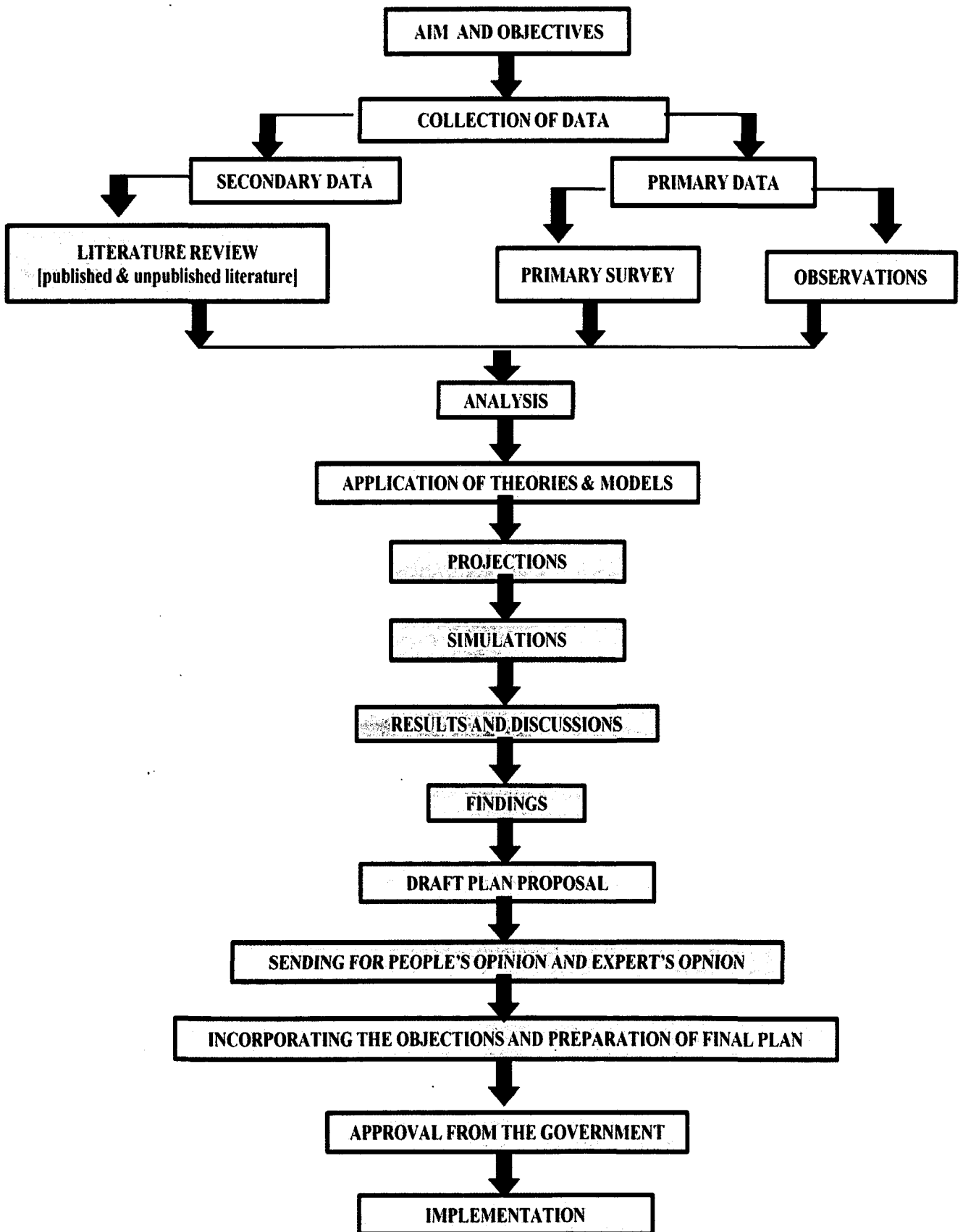


Figure 3.13: Showing Planning Methodology of Kollam District

3.3.1.5 DIFFICULTIES IN IMPLEMENTATION: The panchayats could not spend more than 10% of the earmarked funds at the end of the first year of people's planning, i.e. by March 1997. The government initially extended the expenditure period by three months; when this was found inadequate the period was extended up to 31 March 1999, i.e. an extension of two years, understandable given the massive exercise based on a 'campaigning' mode. During the second year too, the panchayats could not spend more than 10% of the earmarked funds of around Rs750 crore¹ and the period of expenditure was extended by another three months to the end of June 1998 with the stipulation that unspent balances would be deducted from future allocations. By end June 1998, the panchayats formally reported 95% expenditure, the bulk of the funds were withdrawn during the final month. This was due to an interesting innovation. The panchayats withdrew the amount from the government treasuries and deposited them either in public sector organisations (such as the State Electricity Board), which were supposed to execute works for them, or in their bank accounts. And these were shown as 'expenditure'. For the third year, 1998-99, the funds earmarked were Rs 970 crore and the allocation for the fourth year, 1999-2000, was enhanced to Rs1020 crore.

3.3.1.6 EXTENT OF DECENTRALIZATION:

1. In the Health sector all institutions other than medical colleges and big regional speciality hospitals have been placed under the control of the local governments.
2. In the Education sector, in rural areas the high schools and upper primary schools have been transferred to the District Panchayats and the primary schools have been transferred to village Panchayats; in urban areas, all schools have been transferred to the urban local governments.
3. The entire responsibility of poverty alleviation has gone to the local governments; all the centrally sponsored anti-poverty programmes are planned and implemented through them.

4. As regards Social welfare, barring statutory functions relating to juvenile justice, the entire functions have gone to local governments. The ICDS is fully implemented by Village Panchayats and Urban Local Governments. Care of the disabled, to a substantial degree has become a local government responsibility.
5. In the Agriculture and allied sectors, the de facto and de jure local government functions are Agricultural extension including farmer oriented support for increasing production and productivity, Watershed management and minor irrigation, Dairy development, Animal Husbandry including veterinary care & Inland fisheries.
6. Barring highways and major district roads, connectivity has become local government responsibility.
7. The whole of sanitation and most of rural water supply have moved over to local governments.
8. Promotion of tiny, cottage and small industries is mostly with the local governments.
9. All the welfare pensions are administered by the local governments.

3.3.2 DISTRICT PLANNING OF KARNAL DISTRICT, HARYANA:

3.3.2.1 INTRODUCTION: KARNAL is an important city and the headquarters of Karnal District in the state of Haryana.

- AREA – 7,932 sq.km
- POPULATION – 12,74,183(2001)
- Males – 53% population
- Females – 47% population.
- Literacy Rate -72% (avg)

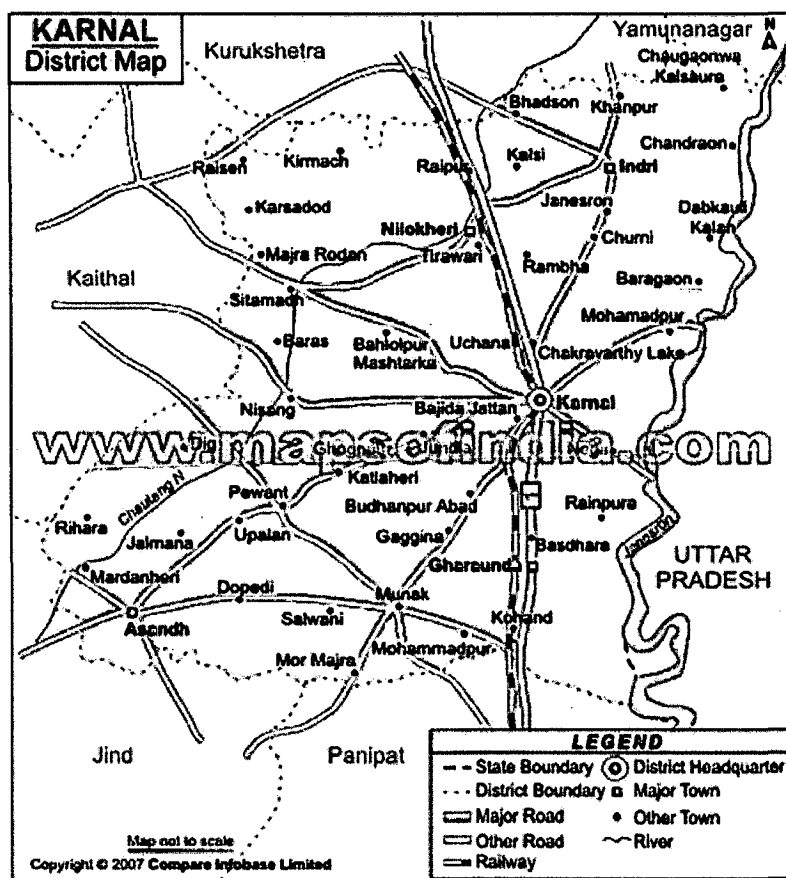


Figure 3.14: Showing Map of Karnal District

BASIC STATISTICS:

Table 3.03: Showing Population of Karnal District

Population: Municipal Committee wise			
Sr. No.	MC Name	Population	Literate
1	Karnal	222017	159090
2	Gharaunda	30172	19807
3	Taraori	22201	13565
4	Assandh	22707	13845
5	Indri	14511	9099
6	Nilokheri	16405	11901

Table 3.04: Showing Details of Karnal District

No. of Sub-Divisions	2
No. of Tehsil	5
No. of Sub-Tehsil	3
No. of Development Blocks	6
No. of cities	1
No. of Towns	5
No. of Villages	434
No. of Panchayats	380
No. of Panchayat Samities	6
No. of Zila Parisad	1
No. of Municipalities	6
No. of Police Stations	11
No. of Women Police Stations	1

3.3.2.2 LOCATION: Karnal is important city on Delhi Ambala Rail Line & Sher Shah Suri Marg (G. T. Road), connected with all important places in the country. It is 123 Kilometre from Delhi & 130 Kilometre from Chandigarh. Karnal District lies on the western Bank of river Yamuna which once flows about 11 Kilometre to the east forming eastern boundary of the district. The river Yamuna separates Haryana from Utter Pardesh. The Karnal District including Panipat lies between 29°09'50" and 29°50' North latitude and 76°31'15" and 77°12'45" East longitude, its height from sea level is between 235 and 252 meters. The Karnal District is surrounded by Kurukshetra District on its north-west, Jind & Kaithal District on its west, Panipat District on its south and Utter Pradesh on east.

3.3.2.3 GEOGRAPHICAL/PHYSICALASPECTS: Yamuna River forms eastern boundary of the district and flows from north to south. The district is a part of the Ganga-Sindus (Indo-Gangetic) plains and has a well spread net work of western Yamuna canal. Its geographical area has been divided in to three agroclimatic regions, Khadar, Bhangar and Nardak belt. Khadar starts from Indri-Karnal road one mile away from Karnal covering the area in between Yamuna river and National Highway Road No.1 upto

Patti-Kalyana village. Bhangar area starts from west of Khadar area covering Gharaunda, development block. The nardak area lies in Nissing, Nilokheri and Assandh development block. However, its water is saline and not fit for irrigation.

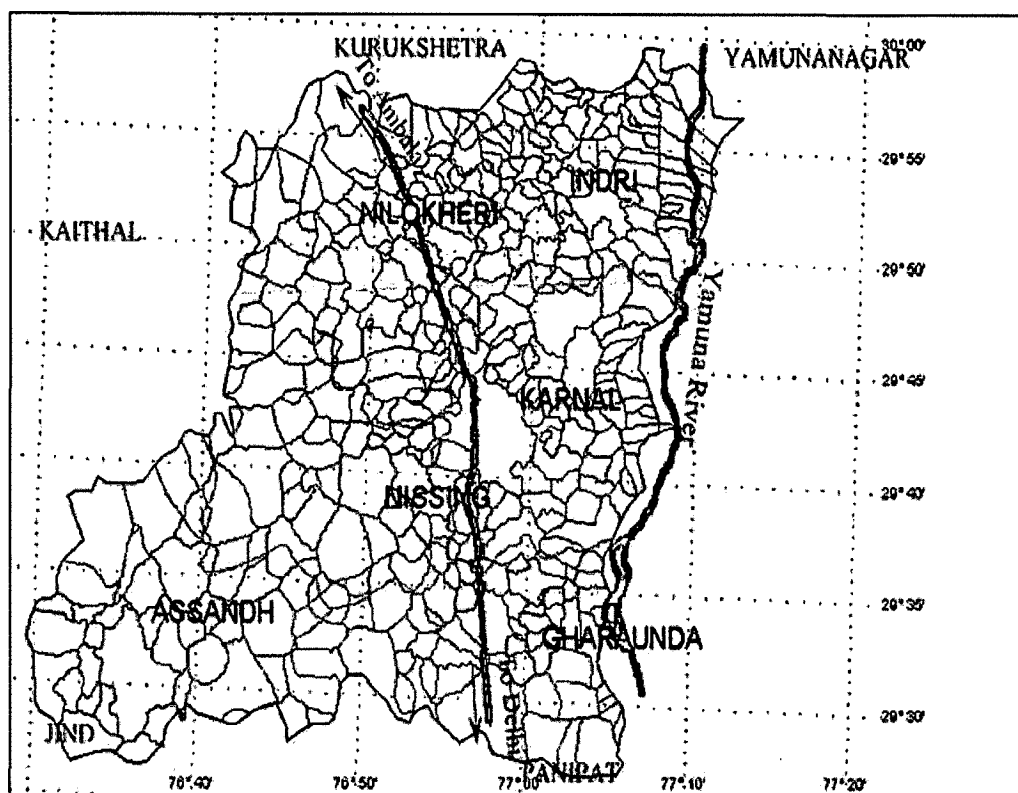


Figure 3.15: Showing Village Boundaries of Karnal

3.3.2.4 OBJECTIVES OF THE STUDY

- To evaluate the spatial structure of agricultural landuse, population, settlements, economic activities, services and existing space relations.
- To identify the existing pattern of central places.
- To rank the settlements on the basis of composite functions.
- Synthesis of a spatial development strategy for planning at and below the District Level.

The study is attempted at two levels:

- At the District Level and
- Within that the Karnal tehsil

The district level study was oriented to an assessment of the spatial patterns of settlements, functions and their relative importance pr rank and the hierarchic nature of spaces for more than 2000 population.

3.3.2.5 METHODOLOGY ADOPTED

1. Study of space relationship in 2 stages:

Compilation and mapping.

Tabular analysis of data on bus frequency.

2. Graph technique:

Sieving out nodal hierarchy of major and sub-ordinate nodes.

3. Grouping of Settlements:

Nodal hierarchy.

Ranks by composite scores.

4. Sample survey of households:

Knowledge of regional structure space relations.

Information on agriculture, its allied activities, services and amenities.

5. District Planning exercise:

Areal and Locational components.

3.3.2.6 REGIONAL STRUCTURE – SALIENT FEATURES AND SPATIAL ARRANGEMENTS:

- Features of settlement structure.
- Patterns of distribution.
- Space relation through linkages.
- Location of economic activities.
- Relationship with adjoining areas.
- Regularity in spatial arrangements.

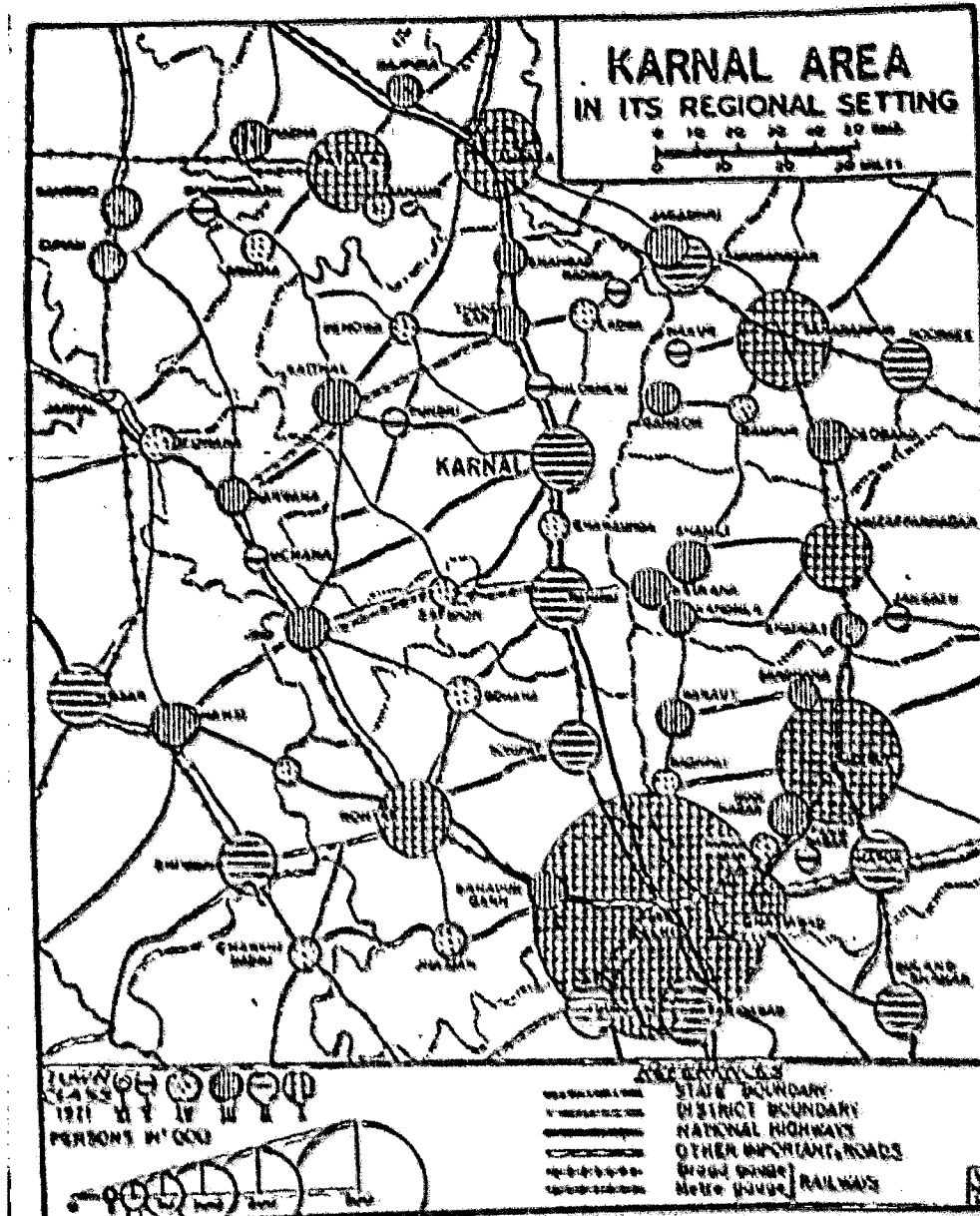


Figure 3.16: Map showing Karnal area in its Regional Settings

3.3.2.7 SPATIAL PATTERN OF DISTRIBUTION OF RICE AND WHEAT: This is done with 2 objectives:

1. Proper location of inputs and facilities for transaction of surplus.
2. Physical landscape influences the production concentration.

These objectives are dealt keeping in view the Integrated Area Development.

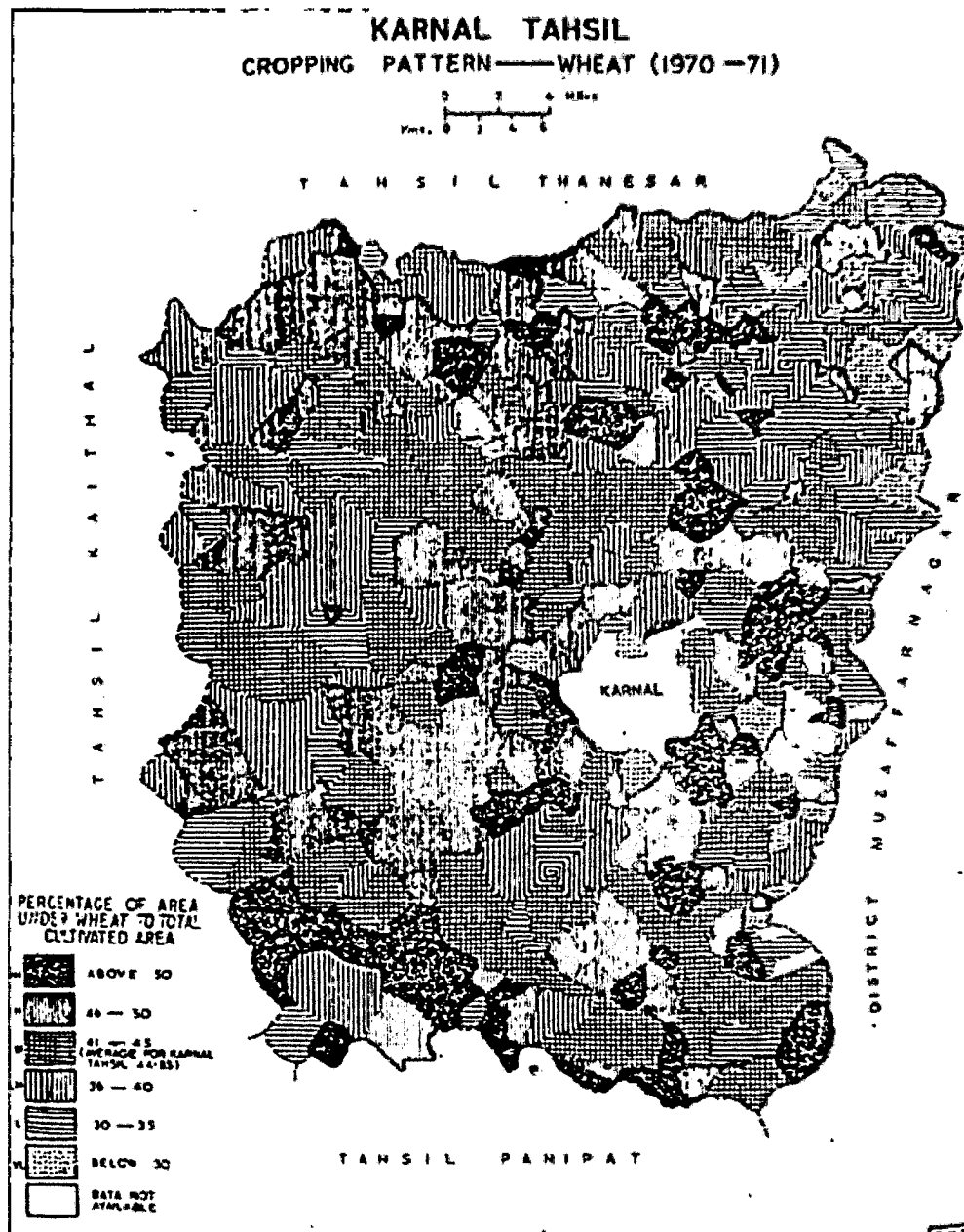


Figure 3.17: Map showing Karnal tehsil and its Cropping Pattern

3.3.2.8 SPATIAL PATTERN OF DISTRIBUTION OF SETTLEMENTS IN KARNAL DISTRICT – NEAREST NEIGHBOR ANALYSIS

- Study the pattern of connectivity and linkages to find physical infrastructure shortcomings like Transportation, Road Condition, etc.
- Population density and Growth (1951-1971) was studied
- REGRESSION ANALYSIS was done to find out the relationship between Population Size and Growth Rate.

3.3.2.9 PATTERN OF DISTRIBUTION OF SELECTED SERVICES AND FACILITIES:

- Educational facilities
- Medical facilities
- Postal facilities
- Banking
- Fertilizer depots

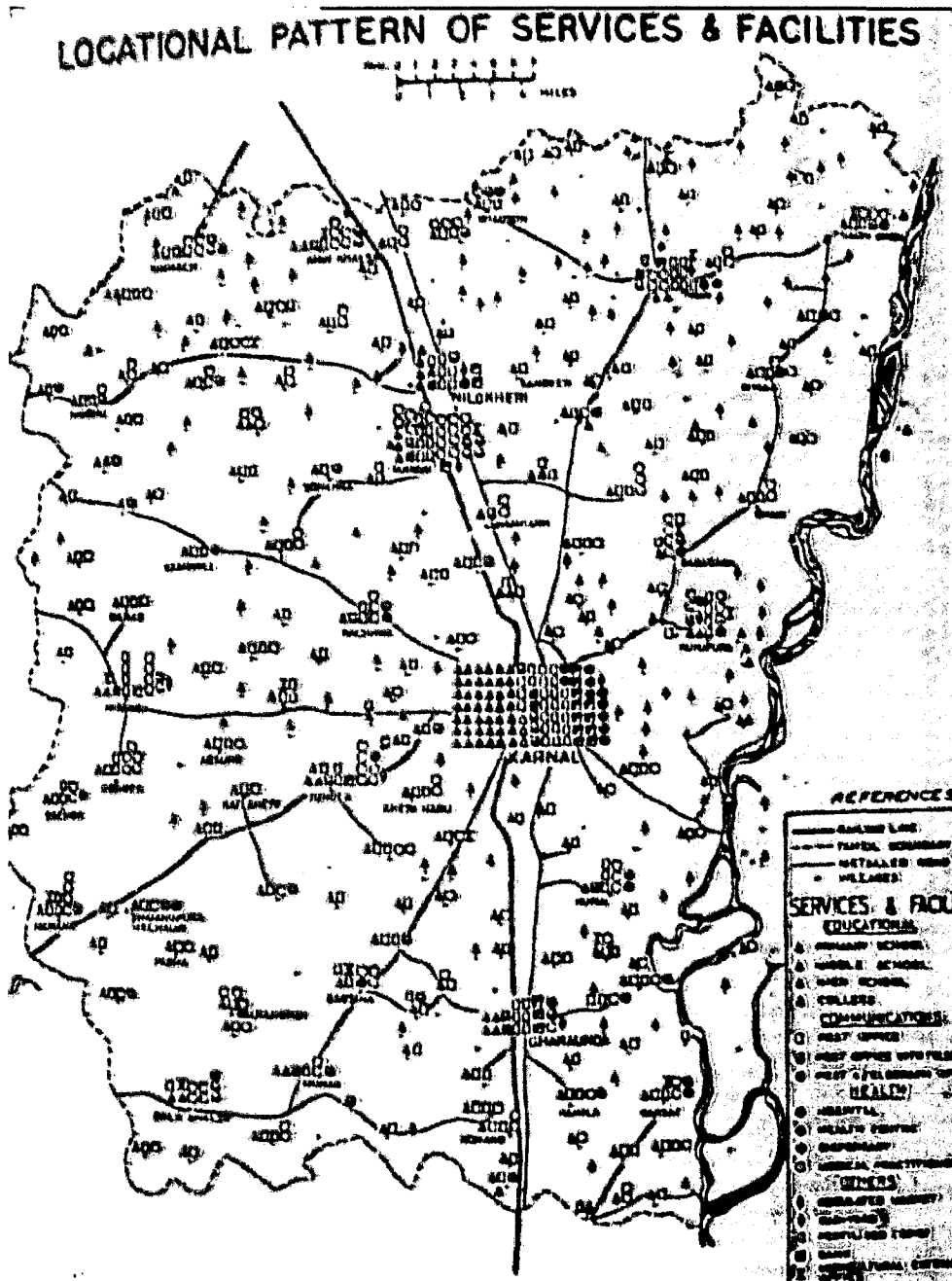


Figure 3.20: Map showing Locational Pattern of Services and Facilities of Karnal tehsil

3.3.2.10 COMPOSITE RANKING AND HIERARCHY OF SETTLEMENTS:

- By determination of weightages to indicators
- Alternative schemes for ranking settlements
- Final ranking of settlements on the basis of composite indices from all the alternatives
- Pattern of classification of settlements

3.3.2.11 INFERENCES:

1. Creation of Central Spaces for Integrated Area Development.
2. Functional organization of relatively homogeneous geographical regions.
3. Even distribution of benefits of development and lessening of intra-regional disparities.
4. Application of Walter Christaller's Central Place Theory in planning.
5. Hierarchic pattern would bring about greater efficiency in 'Economies of Scales' and avoid wastage.
6. Also, from the agricultural development point of view, locations of centres equipped with inputs, infrastructure and facilities would reduce the levels of consumption.

3.3.3 INTEGRATED DISTRICT DEVELOPMENT PLAN OF SAGAR DISTRICT, MADHYA PRADESH, 2005, NARESH KUMAR PATEL: Sagar District is a district of Madhya Pradesh state in central India. The town of Sagar serves as its administrative center. Sagar is bounded by Lalitpur District of Uttar Pradesh state to the north, and the Madhya Pradesh districts of Chhatarpur to the northeast, Damoh to the east, Narsinghpur to the south, Raisen to the southwest, Vidisha to the west, and Ashoknagar to the northwest.

3.3.3.1 LOCATION: The district of Sagar lies in the north central region of Madhya Pradesh. The district has a Central location in the country. The tropic of cancer passes through the southern part of the district.

AREA - 10,252 sq. km.

POPULATION - 2,021,783 (2001 census)

16TH largest district in size in the State.

Connectivity: The district is accessible by rail as the town of Sagar lies on the Bina - Katni branch line of Central railway. The district is traversed by first class roads which connect it with important towns like Damoh and Jabalpur. The major roads crossing the District are NH-26, linking Jhansi and other Districts of MP, SH-14 and SH-18.

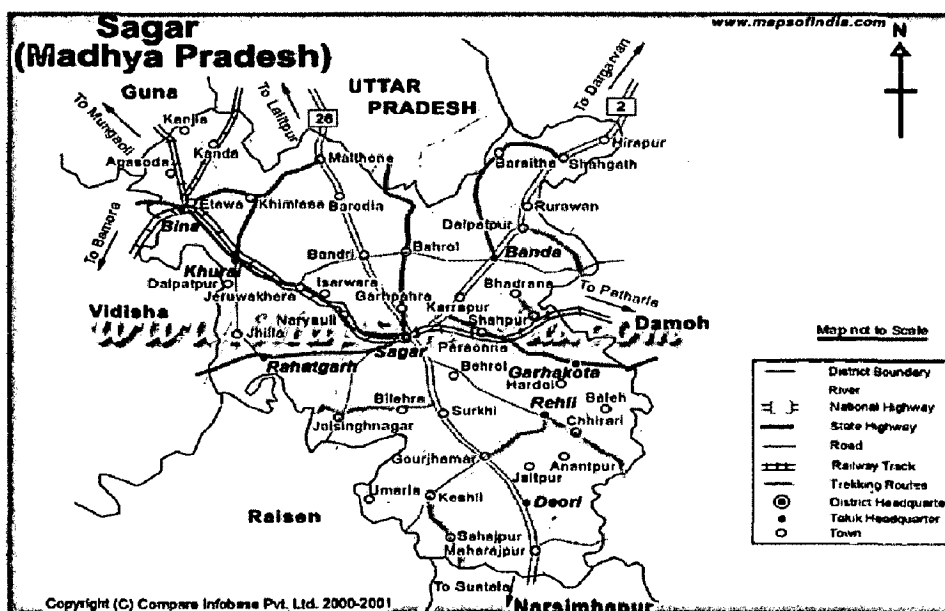


Figure 3.21: Showing District map of Sagar, M.P.

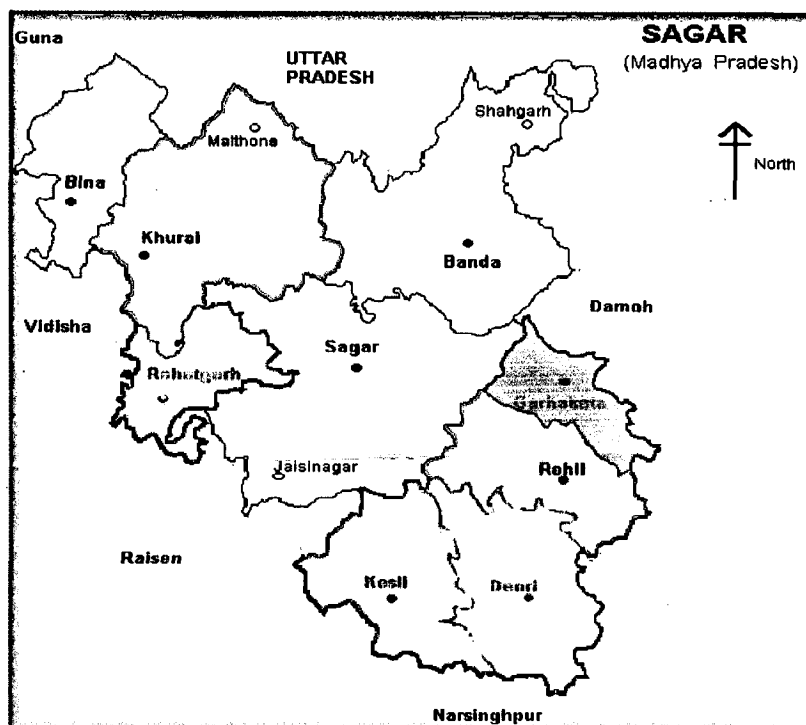


Figure 3.22: Map of showing Tehsils of Sagar district

District / Tehsil wise area, Population and Density:

Table 3.05: Details of Sagar District

S. No.	District Tehsil	Area (in sq. km)	Population	Density
1.	District Sagar	10252.00	2021783	197
2.	Tahsil Sagar	1659.57	693691	418
3.	Tahsil Rahatgarh	816.12	105633	129
4.	Tahsil Rahli	502.61	117636	234
5.	Tahsil Garhakota	373.58	101419	272
6.	Tahsil Deori	818.85	151275	185
7.	Tahsil Kesli	696.39	100405	144
8.	Tahsil Bina	687.17	173816	253
9.	Tahsil Khurai	1435.46	294214	205
10.	Tahsil Banda	1538.04	283694	212

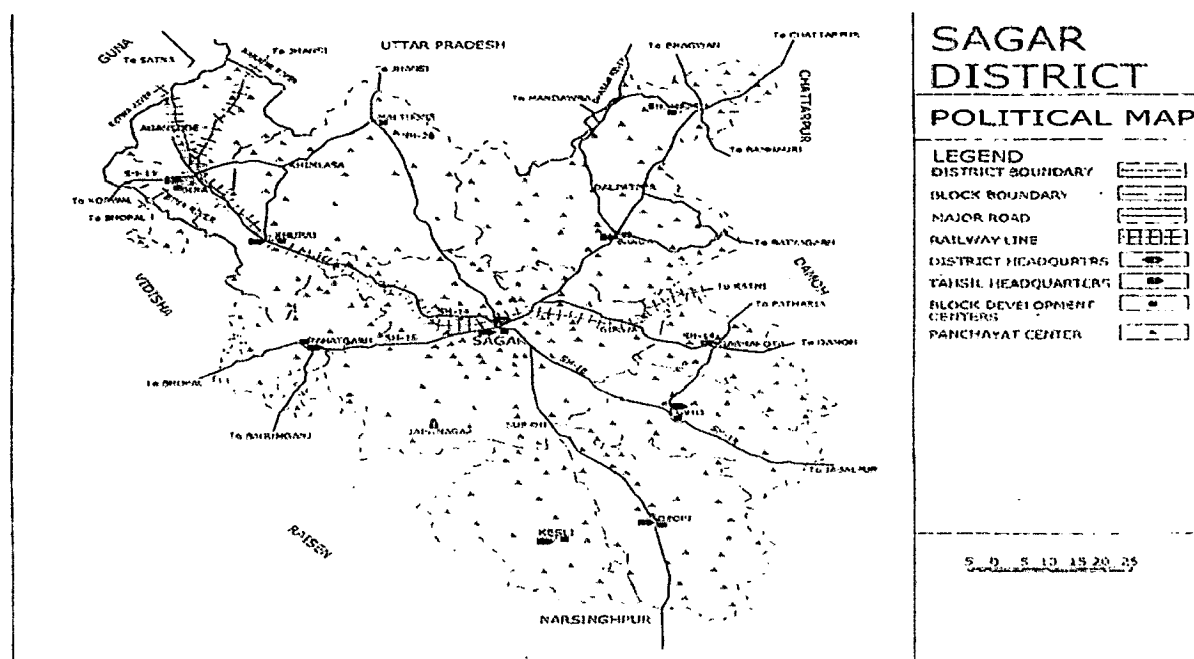


Figure 3.23: District Map of Sagar showing Block Development and Panchayat Centres

Table 3.06: Showing Land utilization (sq.km)

S.No.	Land-use particulars	1998-99	2001-02	Remarks
1.	Total geographical area	10252.00	10252.00	-----
2.	Forests	2888.09	2192.92	695.17(-)
3.	Land for non-agricultural use	690.97	689.71	1.26(+)
4.	Pastures and grazing land	215.48	278.81	63.33(+)
5.	Net area sown	5319.83	5361.67	41.84(+)
6.	Area sown more than once	1570.65	1584.79	14.14(+)
7.	Total cropped area	6890.48	6946.79	55.98(+)
8.	Net irrigated area	1684.39	1791.52	107.13(+)
9.	Gross irrigated area	1684.39	1791.52	107.13(+)

SOURCE: Land record Department, District Sagar

3.3.3.4 PLANNING RELATED PROBLEMS IN THE DISTRICT: Under utilization of facilities: It is experienced in the district that initially facilities are provided with the objective of serving the people of the district. Initially, the facility starts work with very enthusiastically but later it is found that it is performing far below the expectation of the people. Poor performance of programs like Jawahar Rojgar Yojna (JRY) and Swarnajayanti Gram Swarozgar Yojana (SGSY) etc: Data of the district regarding performance of programs shows that the programs like JRY, SGSY, EWS, FFW etc. are not performing well. The reasons behind their poor performance in the district are detailed below.

Lack of agro processing unit: Sagar district mainly consist of agriculture and allied activities. Data shows that more than 50% land is utilized for the agriculture production and about 70.38% people are depending on agriculture for their livelihood. It is surprising that no agro processing unit is located in the district. It is observed that even having wide expectation of generation of employment opportunities, people are not getting optimized benefits through this sector due to absence of agro processing unit.

Disparity among Tehsil Development blocks: Disparity among Tehsil development blocks can be seen through following:

Urbanization level, Concentration of facilities, Connectivity & Marketing Facilities

Disparity in distribution of facilities: People living in remote areas are unaware about the benefits of facilities as they remain untouched with them. Basic facilities like piped drinking water, internal roads, sanitation facilities etc are still limited to large settlements only. So the living standard of people in other settlements is not up to the mark. Mandies and other market places being situated in urban areas, people have to spend much money in transporting their produce to market places. As such a part of income of farmers goes to pay. it and reduces the income. Facilities remain underutilized as the access by people, to whom that is located, is suppressed due to remoteness of the place of facilities.

Lack of facilities for promotion of frequent income generating activities in rural areas: About 70% of population resides in rural areas in district whose incomes depend only on agriculture production i.e. income comes once in a year or in a half year. This is the basic restricting factor working in the rural areas and leads to deterioration of their living condition. It shows that 60% people are under the vicious cycle of poverty.

Agriculture production is not up to the mark: The main occupation of more than 70% population is agriculture and allied activities. The economy of the district depends on the performance of agriculture production. It is observed that in the year of low production, there is fall in commercial sale and in trade by about 40-50%. So there is need for optimization of agricultural production so that at the time of worst year, the production will remain at the level to sustain the economy of district comfortably. It is also required because it will ultimate help the people to increase in income which lead to betterment of rural people.

Lack of administrative control on the Performance of Small scale Industries: There are about 10,000 Small Scale Industries registered in the district. But no one administration knows about their performance. The accountability of these industries a- administration level is totally absent. This is encouraging people to take government aid only and then forget to open and work for their better performance. It is observed that the beneficiaries of these aids belong to urban areas and use it for their need.

3.3.3.5 EFFORTS IN DISTRICT PLANNING

1. Finding out the needs for development of district.
2. Spatial and functional gaps must be identified.
3. Suitable program should be drawn up.
4. Decide and determine the package of basic services/ minimum needs.
5. Growth points were identified using PURA concepts.
6. Growth Centre facilities were provided.

3.3.3.6 INFERENCES

Positive Points:

- PURA concept has been very well conceptualized.
- Growth centres and Growth points have been identified and proper distribution of services and amenities based on hierarchy has been provided.
- Planning related problems in the district have been identified.

Negative Points:

- PURA concept deals with the identification of the hierarchy of spaces, including both rural as well as urban areas. But the character of urban area is totally different from that of rural area.
- Interconnectivity and interdependency of different growth centres and growth points have not been worked out.
- More emphasis has been given on 4 connectivities and people's participation in identification of potential sectors has not been incorporated.
- No analytical work has been done based on the primary data, only secondary data has been utilized for projections.
- No theories have been applied to work out the model, only pictorial model have been evolved.

CHAPTER – 04

STUDY AREA PROFILE

STUDY AREA PROFILE

4.1 DISTRICT AT A GLANCE: Tinsukia District is located in the upper region of Assam with its headquarters at Tinsukia. The administrative district of Assam is bounded by Arunachal Pradesh in East and South, by Dibrugarh district in South west and by Dhemaji district in the north, which is separated from Tinsukia district by river Brahmaputra. Major towns in Tinsukia district are Tinsukia, Digboi, Margherita, Doomdooma and Makum. Tinsukia is one of the 23 districts of the state of Assam, with Tinsukia town as the head-quarter. Tinsukia was known as Bangmara in the olden days when it was first built by Sarbananda Singha with the help of his Minister, Gopinath Barbaruah.

4.1.1 LOCATION AND GEOGRAPHICAL UNITS: The Tinsukia district was carved out on 01.01.89 from the erstwhile Dibrugarh district for better administration. The district is located in Upper Assam lying between latitude $27^{\circ}12'$ to $27^{\circ}57'$ and longitudes $95^{\circ}15'$ to $96^{\circ}3'$. The district is spread over an area of 3790 km² and has a population of 1,150,062 as per 2001 census details. Ever since its formation, the district continues to have three sub-divisions, viz. Tinsukia, Margherita and Sadiya, with seven community development blocks namely, **Guijan, Hapjan, Itakhuli, Kakopathar, Margherita, Sadiya and Saikhowa**. It is situated on national highway 37 at a distance of 491 kilometer east of Dispur, Guwahati, capital of Assam.

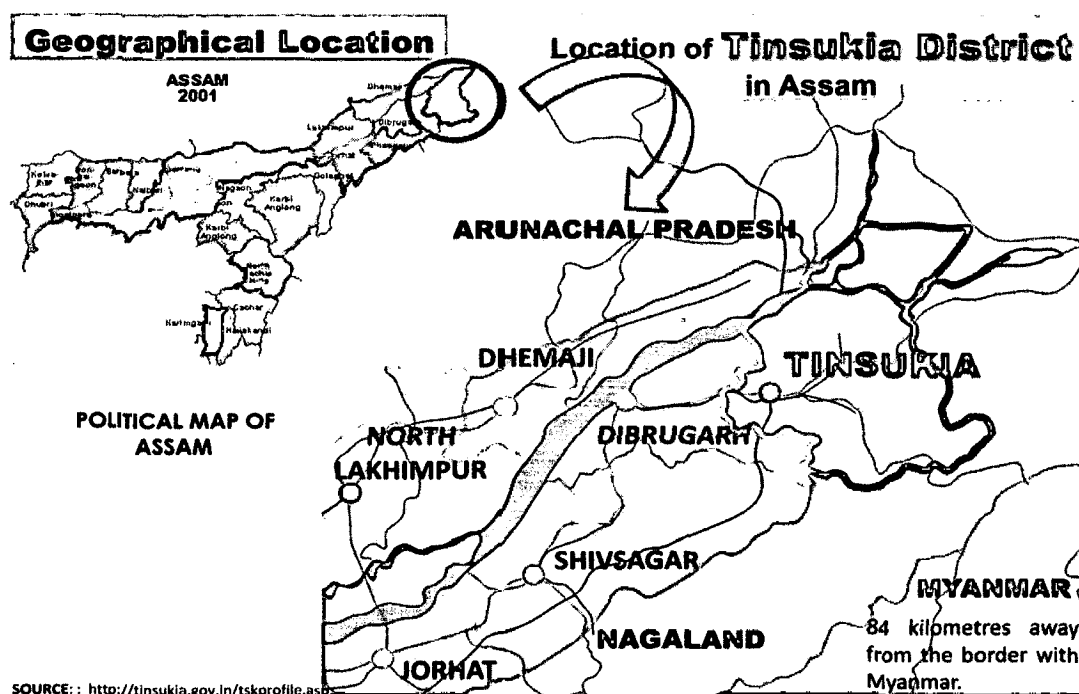


Figure 4.01: Showing the Geographical Location of Tinsukia District

STUDY AREA PROFILE

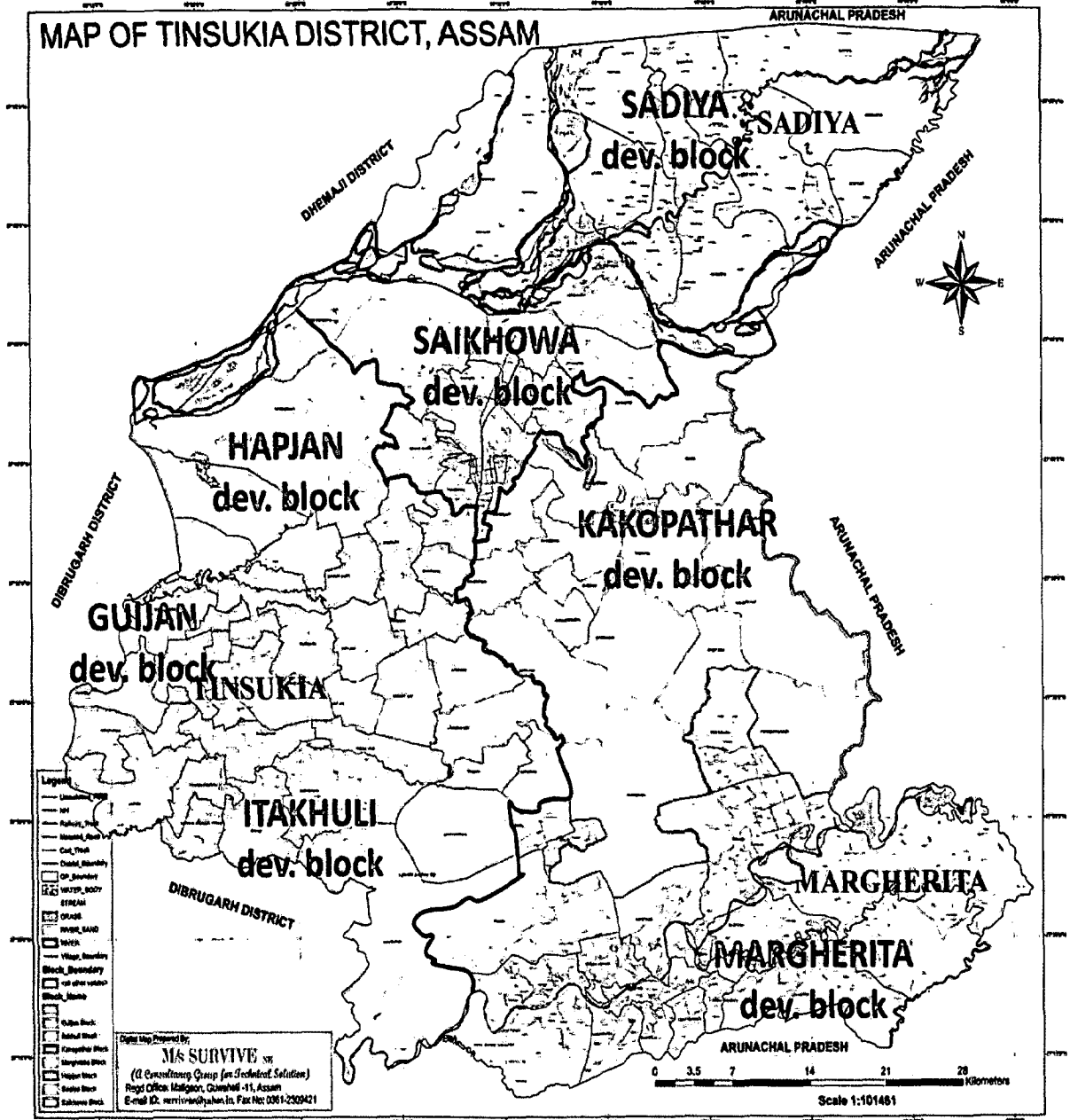


Figure 4.02: Showing map of Tinsukia District showing different Blocks

4.1.2 HISTORICAL BACKGROUND: Tinsukia was originally the capital of the Matak kingdom and was known as Bangmara. King Sarbananda Singha was the last king of the Matak kingdom during 1791. The name Tinsukia was derived from “Tinkunia Pukhuri”, a huge triangular pond dug during the reign of the king. The British took control of Matak kingdom in 1839.

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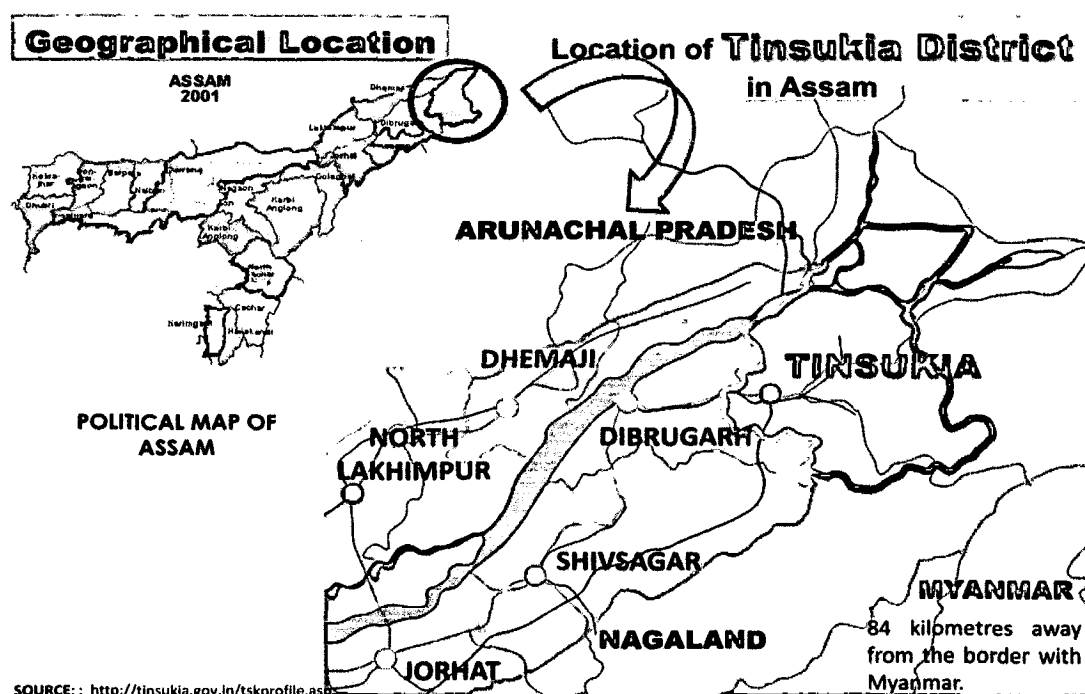


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STUDY AREA PROFILE

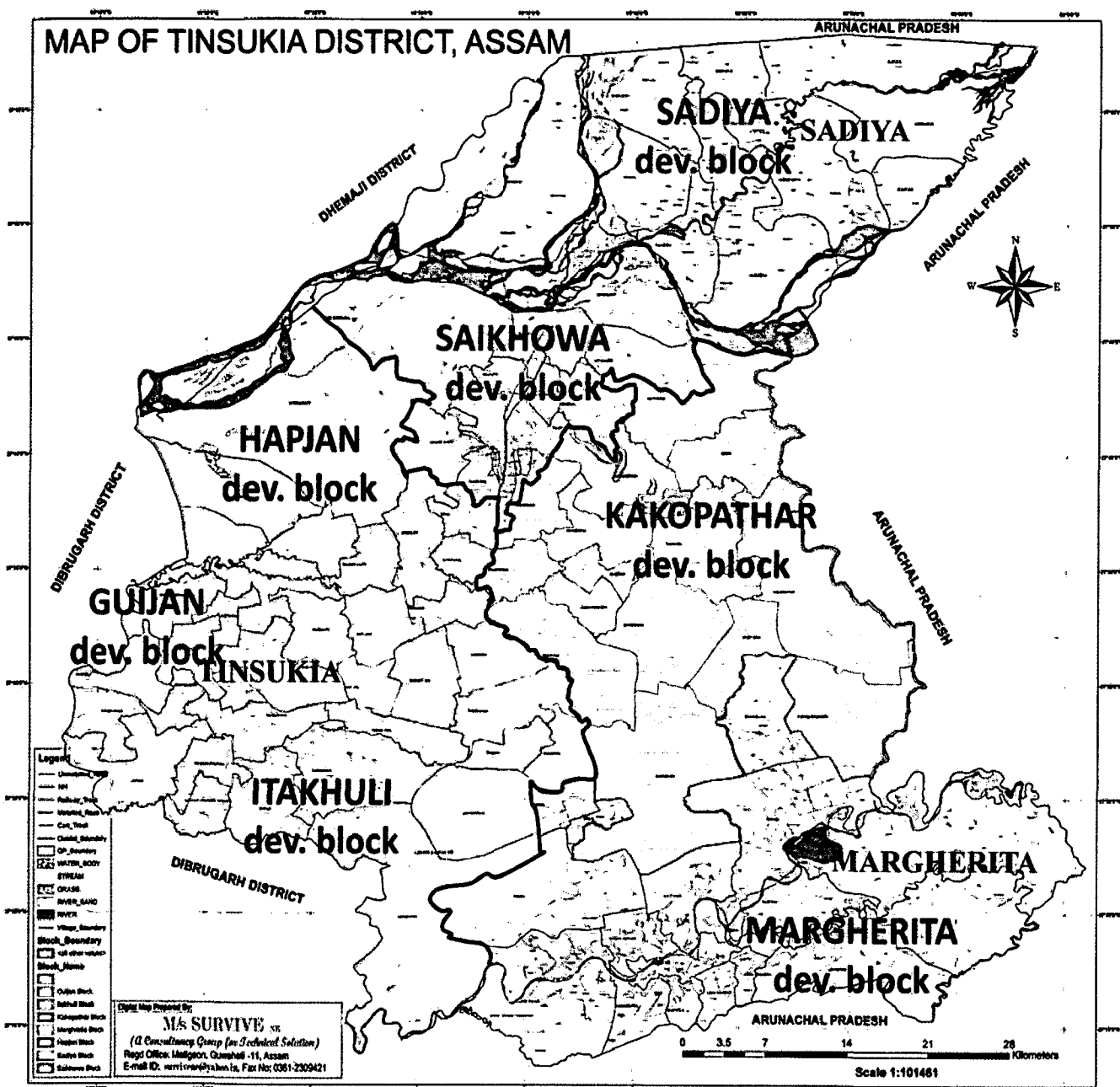


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4.1.3 PHYSICAL ASPECTS

TOPOGRAPHY: The district has four distinct physiographic divisions,

- a) Floodplain along the river Brahmaputra,
- b) Younger and older alluvial plains,
- c) Terrace deposits at the foothills regions of the south and the south-eastern parts and
- d) Dissected hillocks of tertiary group in the south and the south-eastern parts.

The most important river is Brahmaputra, apart from the other comparatively small rivers namely Buri – Dihing, Tigrai, Digboi, etc. Flood and bank erosions are common occurrences related to these rivers. The soil type of the district varies from sandy to clayey and acidic in nature.

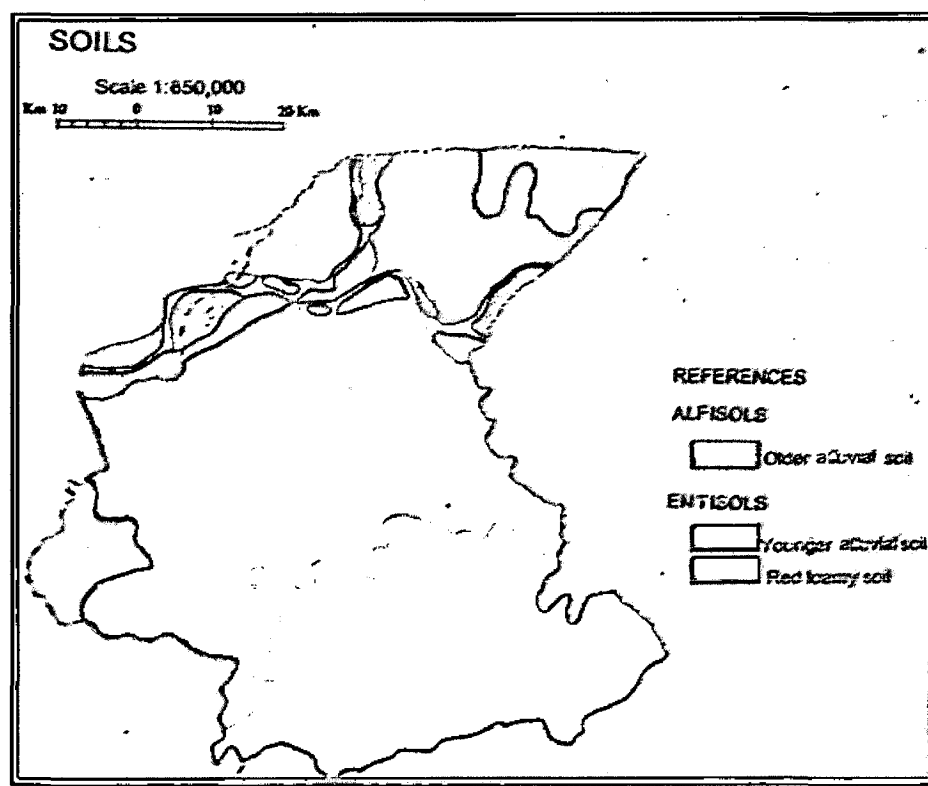


Figure 4.03: Showing Geomorphologic map of Tinsukia district

CLIMATE: The climate is subtropical, warm and humid with an average annual rainfall of 2800 mm. and average rainy days are 140 to 150 days per year. The summer season prevails from May to August, followed by monsoon. The months of September and October constitute the main Northeast monsoon season. The winter season prevails from November to March.

STUDY AREA PROFILE

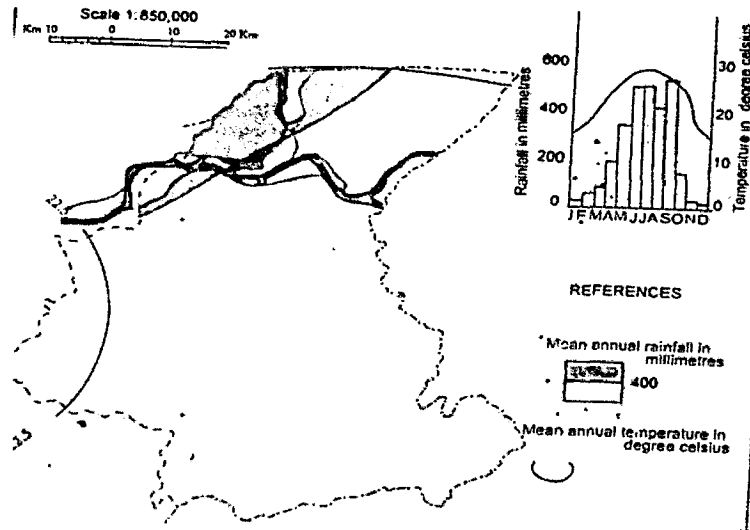


Figure 4.04: Showing Climatic Conditions of Tinsukia district

TEMPERATURE: The average maximum temperature is about 36⁰ C and minimum 4.6⁰ C. The humidity is more than 90 per cent during rainy season. The climate is excellent and nature has bestowed all its blessings in the form of deep forest, grand rivers, exquisitely beautiful landscape, diverse flora and fauna, lovely tea gardens and bio-diversity hot spots.

4.1.4 SETTLEMENT PATTERN: The distribution pattern of population around settlements depends on the following factors:

- Available infrastructure
 - Administrative setup
 - Accessibility (rail & road)
 - Market facilities
 - Employment opportunities
- **Availability of infrastructure:** The reason for present population distribution in settlements is the availability of infrastructure like school, college, electricity, water supply, sanitation, health, recreational and transport facilities. The infrastructure of Tinsukia city is good. It has several government colleges, several public and private schools, electricity (16-18 hours daily), etc. therefore, it has maximum magnetic range in the whole district.
 - **Administrative setup:** Another reason for present settlements pattern is governed by administrative set up in district. All major government offices, judiciary, courts etc. lie in Tinsukia city.

STUDY AREA PROFILE

Other major settlements like Makum, Margherita, Sadiya, etc have block development and panchayat offices. These settlements also have offices like health, electricity of their concerned areas.

Table 4.01: Showing the Administrative setup of the district

Administration			
1	Villages	Nos.	1162
2	Inhabited	Nos.	1138
3	Un-Inhabited	Nos.	24
4	Police Station	Nos.	11
5	Police Out-post	Nos.	6
6	Border police Out-post	Nos.	5
7	Fire Service Station	Nos.	3
8	Revenue Circle	Nos.	4
9	Development Block	Nos.	7
10	I.T.D.P.	Nos.	1
11	Gaon Panchayat	Nos.	88
12	Zilla Parishad	Nos.	1
13	Sub-Division	Nos.	3

Source: District Statistical handbook, 2008

- **Accessibility:** The connectivity is fair and all major settlements lie on the three major national highways. The Northern Frontier Railway is responsible for transport of men, labour and goods. Tinsukia district is well connected with states like Arunachal Pradesh, Nagaland, and New Delhi etc.
- **Market facilities:** Tinsukia can boast of one of the biggest wholesale market in North east region. A large number of shopping centres are under construction and some have already been inaugurated. Due to these commercial activities, it is of economical growth and importance.
- **Employment opportunities:** In the district there are problems of unemployment. Many educated and qualified youth do not have deserving jobs although the literacy rate of the district is much higher than the national average. Due to this reason, people are moving towards better and bigger cities in search of job opportunities.

4.2 DEMOGRAPHIC PROFILE: The total population of the district is 1,150,146 as per the 2001 census, out of which 926105 i.e., 80.52% live in rural areas. The density per sq.km of Tinsukia district is 303 with a sex ratio of 909 females per 1000 males. The literacy rate is 63.28%. The percentage of workers to the total population is 40.55% out

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of which 2.50% are agricultural workers and the rest 38.05% belongs to non – agricultural groups. The detailed demographics are mentioned in the table listed below:

4.2.1 POPULATION STATISTICS:

Table 4.02: Showing the Population Statistics of the district

SL. No.	Population Statistics		
1	Total Population	Nos.	11,50,146
2	Male	Nos.	6,01,183 (52.27%)
3	female	Nos.	5,48,963 (47.73%)
4	Population Below age 7 years	Nos.	1,79,111
5	Population below age Male	Nos.	91208
6	Population below age female	Nos.	87903
7	Literates	Nos.	614461
8	Literates Male	Nos.	3,68,978
9	Literates Female	Nos.	2,45,483
10	Literacy Rate	P.C.	63.28
11	Density of Population	Nos.	303(per Sq. Km.)
12	Growth rate	P.C.	19.52
13	Sex-Ration	(No. of Female per 1000 male)	913

Source: District Statistical handbook, 2008

Table 4.03: Showing the Population of the district

Population			
1	Total Population	Nos.	11,50,146
2	Male	Nos.	6,01,183(52.27%)
3	female	Nos.	5,48,963 (47.73%)
4	Rural Population	Nos.	926105 (80.52% of total)
5	Male	Nos.	4,79,853
6	Female	Nos.	4,46,252
7	Urban Population	Nos.	2,23,957(19.48% of total)
8	Male	Nos.	1,21,246
9	Female	Nos.	1,02,711
10	Rural S.C. Population	Nos.	16905
11	Rural S.T. Population	Nos.	49967
12	Urban S.C. Population	Nos.	8232
13	Urban S.T. Population	Nos.	15263
14	No. of Occupied Residential Houses	Nos.	17664
15	No. of House Hold	Nos.	178051
16	Schedule Caste	Nos.	31315
17	Schedule Caste Males	Nos.	16601

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18	Schedule Caste Females	Nos.	14714
19	Schedule Tribe POP	Nos.	67234
20	Schedule Tribe Male	Nos.	34688
21	Schedule Tribe Female	Nos.	32546
22	Population Below age 7 years	Nos.	186171
23	Population below age Male	Nos.	94495
24	Population below age female	Nos.	91676
25	Literates	Nos.	6,14,461
26	Literates Male	Nos.	3,68,978
27	Literates Female	Nos.	2,45,483
28	Density of Population	Nos.	303(per Sq.Km.)
29	Literacy Rate	P.C.	63.28
30	Growth rate	P.C.	47.03

Source: District Statistical handbook, 2008

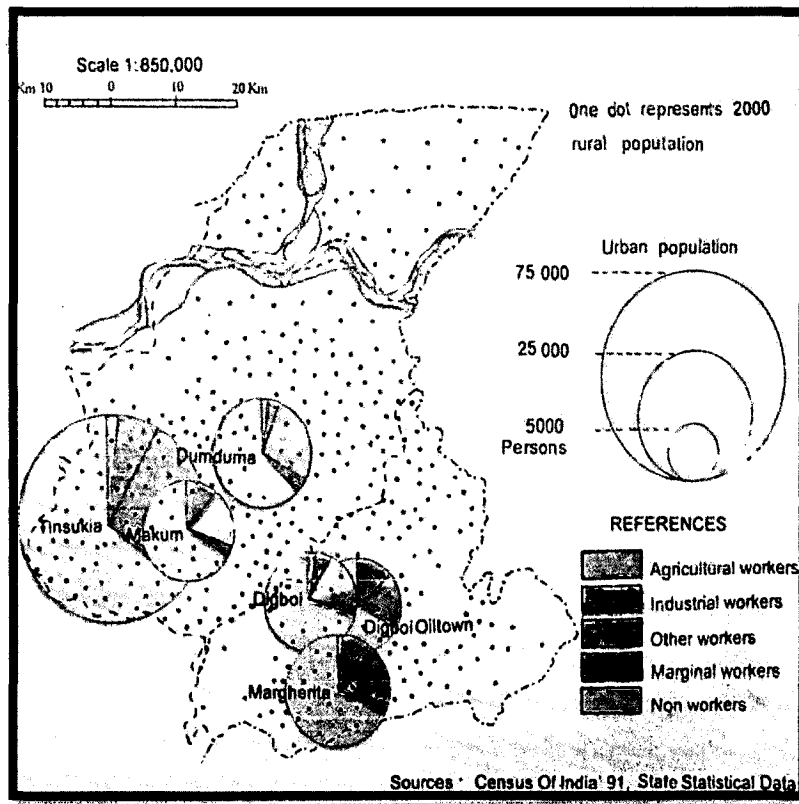


Figure 4.05: Map showing population of major block towns

4.2.2 POPULATION PROJECTION: While projecting population, several factors should be kept in mind which is mentioned below:

- a) Demographic growth rate
- b) Unemployment growth rate
- c) Employment generation rate
- d) Poverty alleviation rate

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- e) Future opportunities
- f) Resource availability in the region

Table 4.04: Showing Projected population of Tinsukia district

(Based on 2001 census) (Population in '000')	
2001	1159
2002	1178
2003	1195
2004	1212
2005	1229
2006	1246
2007	1263
2008	1279
2009	1295
2010	1311

Source: District Statistical Handbook, Assam – 2008

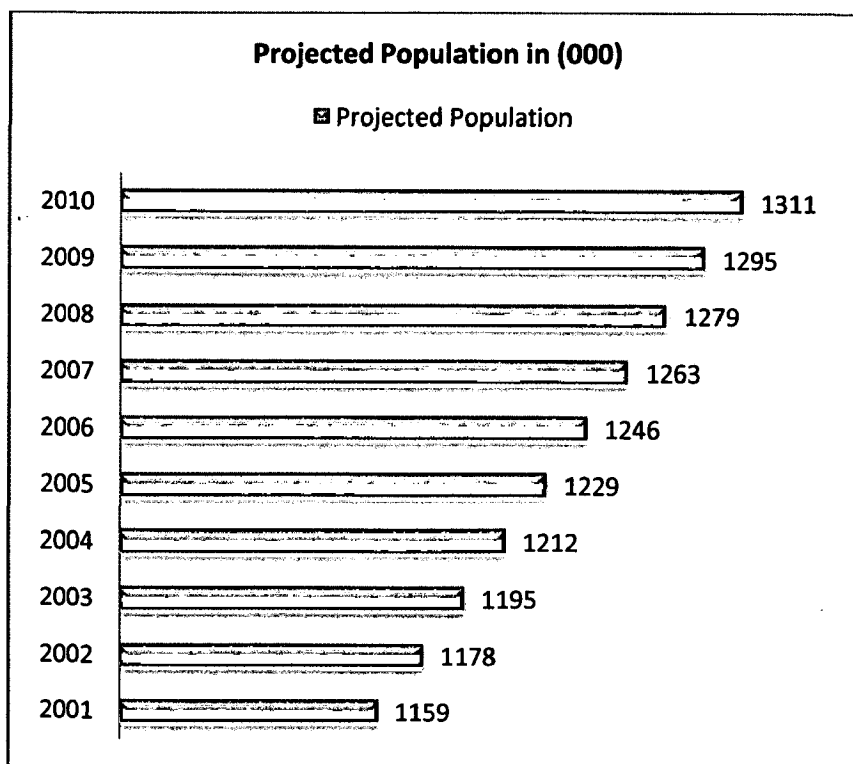


Figure 4.06: Showing Projected population of Tinsukia district

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4.2.3 DECADAL PERCENTAGE VARIATION OF POPULATION IN TINSUKIA DISTRICT: This shows the population increase and decrease over a period of 100 years in the district and also helps to identify reasons for the ups and downs in the population.

Table 4.05: Decadal percentage variation in Population of Tinsukia since 1901

Sl. No.	Decade	Decadal % variation
1	1901-1911	26.29
2	1911-1921	34.07
3	1921-1931	23.7
4	1931-1941	22.7
5	1941-1951	17.94
6	1951-1961	35.92
7	1961-1971	31.02
8	1971-1991	47.03
9	1991-2001	19.51

Source: District Statistical Handbook, Tinsukia – 2008

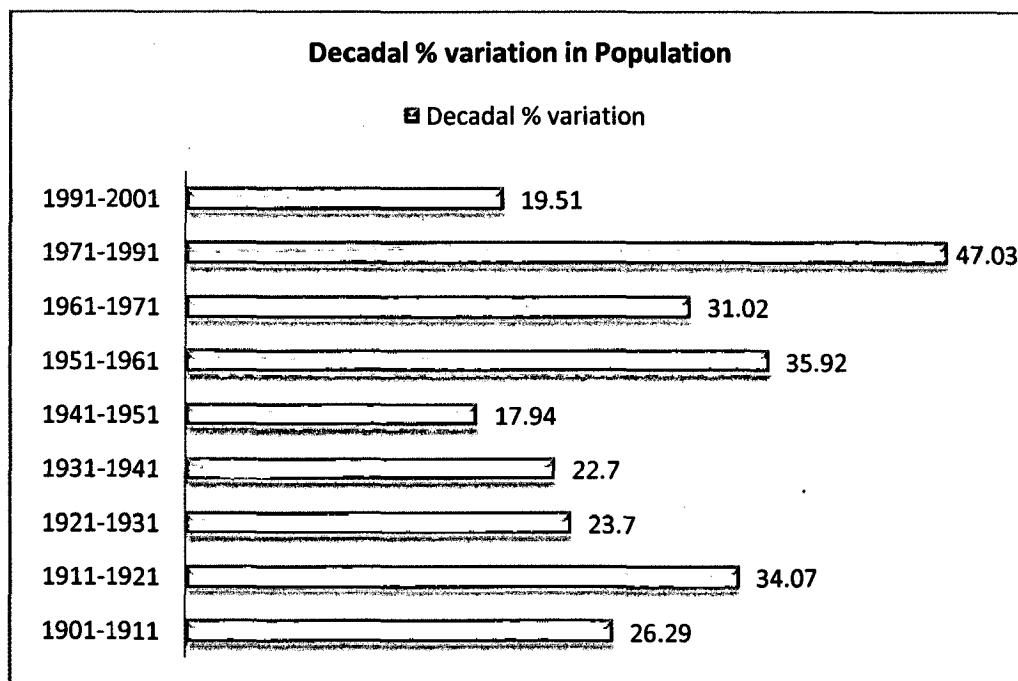


Figure 4.07: Decadal percentage variation in Population of Tinsukia since 1901

4.2.4 OCCUPATIONAL PATTERN OF MAIN WORKERS, MARGINAL AND NON-WORKERS IN RURAL AREAS

In the rural areas of the district the occupational pattern is changing with time, where farming was the most preferred and practicing occupation, now other services are taking over it. Now one third (33 percent) are non workers and one seventh (17 percent) are the main workers. A little less than one seventh (14 percent) are other workers. The percentage of marginal workers and cultivators are very less.

Table 4.06: Type and Population of workers

Type of Workers	Population
Total workers	466351
Main workers	349847
Marginal workers	116504
Non workers	683711
Cultivators	145476
Agricultural Labourers	28806
Industrial workers	8627
Other workers	283442

Source: Statistical Handbook, Assam – 2009

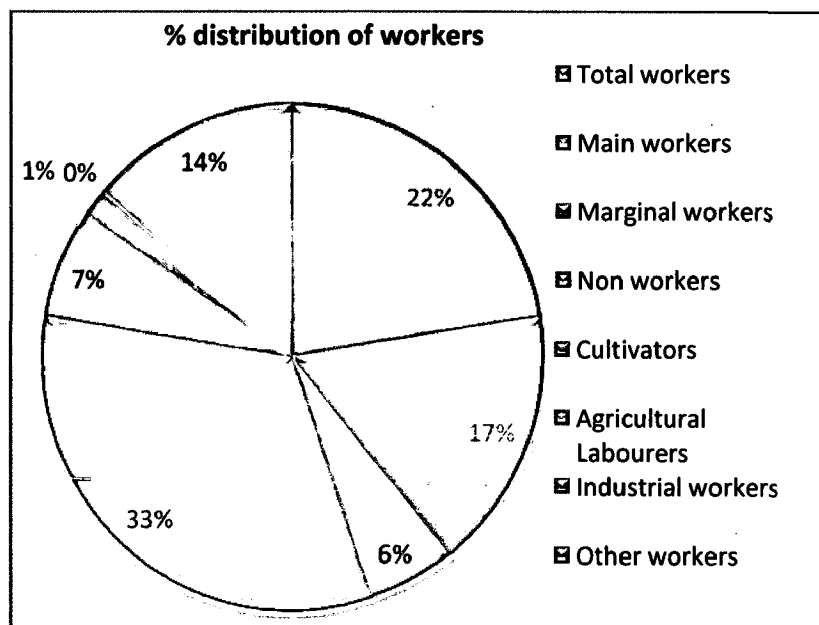


Figure 4.08: % distribution of Type and Population of workers

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4.2.5 LITERACY: In this system, the quality of education is poor but most of the population have access to education and are literate. Almost two seventh (28 percent) of the population are below primary level. Nearly one fourth (24 percent) are primary educated; one fifth (19 percent) have middle level literacy. Same is true for matric and secondary level holder and very feeble population have technical education and higher education.

Table 4.07: Showing population and their level of education

Level of Education	Population
Below Primary	166316
Primary	143102
Middle	109758
Matric/Secondary	100336
High Sec/Pre. University	27961
Non Tech. Diploma	33
Technical	713
Graduate	24927
Literate Without Education	15110
Unclassified	46

Source: Statistical Handbook, Assam – 2009

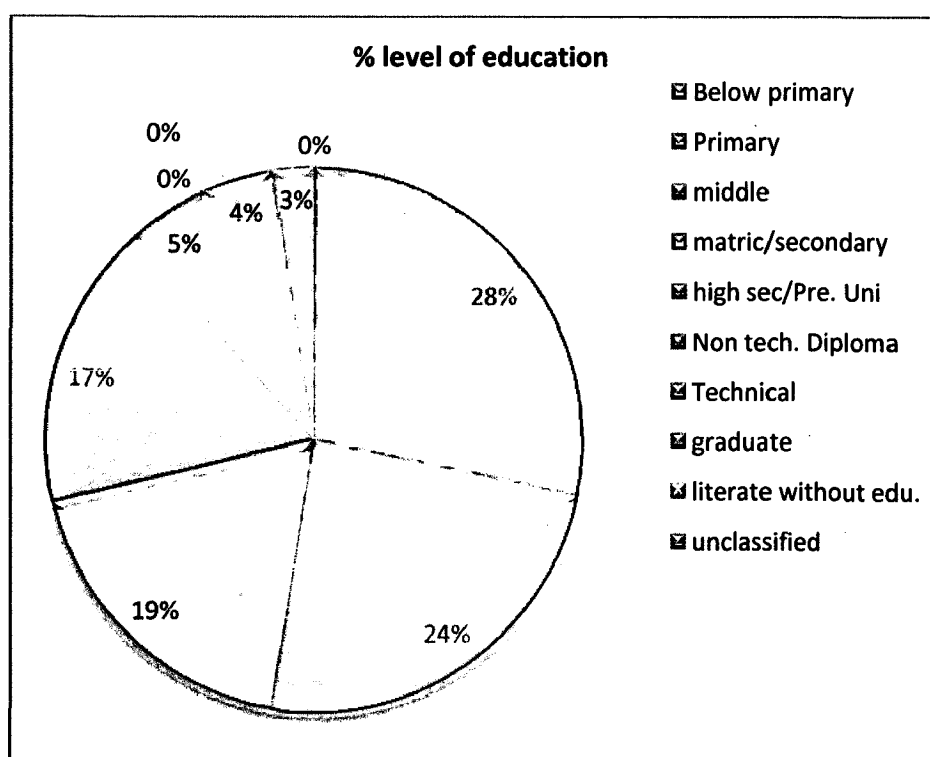
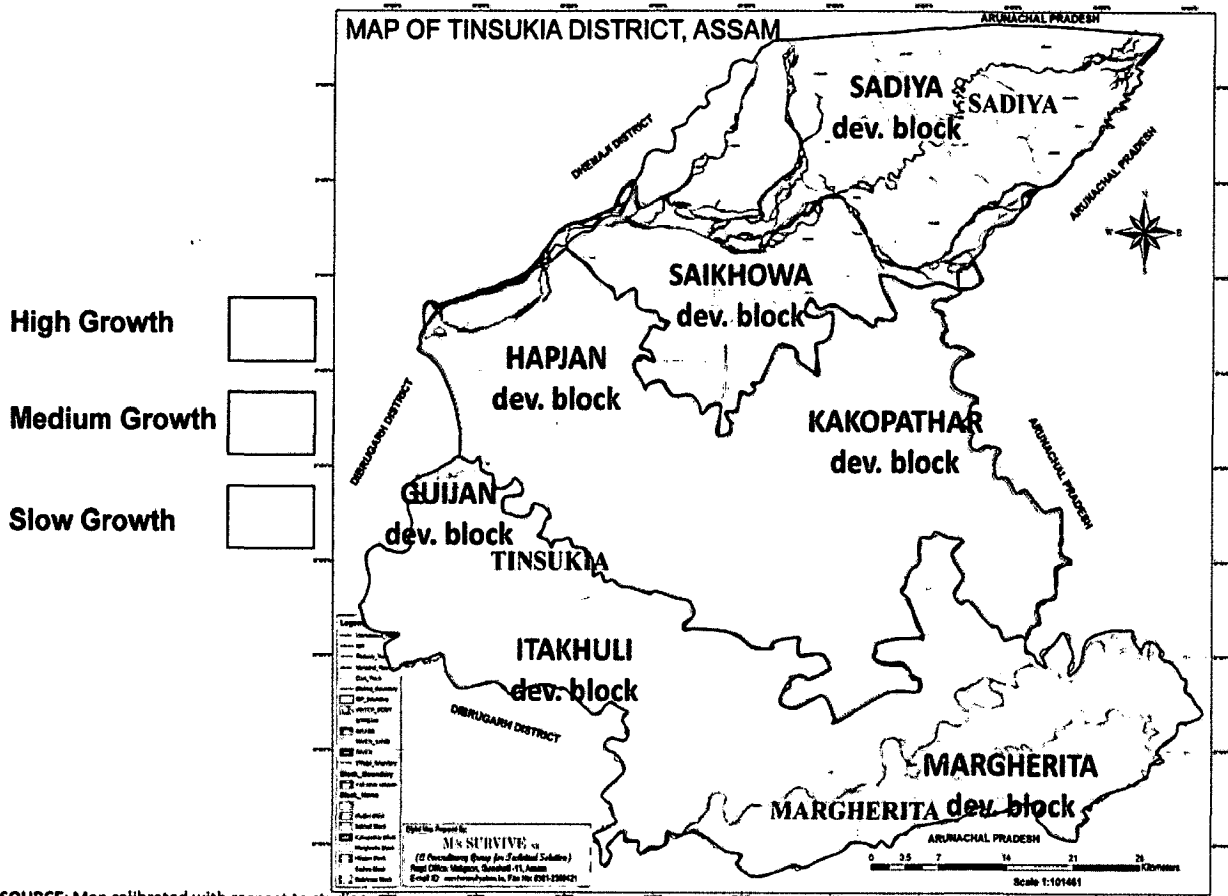


Figure 4.09: % distribution of level of education with population

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4.2.6 AREA: The total area of the district is 3,790 sq. km. Out of which 3,734.68 sq. km is rural area and remaining 55.32 sq. km is the urban area.



SOURCE: Map calibrated with respect to studies

Figure 4.10: Map of Tinsukia District showing Growth Status of different blocks

4.2.7 POPULATION DENSITY: The population density of Tinsukia district is 303 persons per sq.km. The above figure shows density in various development blocks.

4.2.7.1 LAND USE PATTERN AND LAND HOLDINGS: The geographical area of the district is 3.79 lakh hectares out of which 1.34 lakh hectares is under forest and 1.11 lakh hectares is not available for cultivation, which includes 0.74 hectare under non agricultural use. Rest 1.34 lakh hectares fertile land is under cultivation. However, about 0.12 lakh hectares out of 1.11 lakh hectares could not be brought under cultivation. There are 1162 villages with 2,18,885 numbers of household in the district. Out of the total household, 9,551 are large, 32,272 are small, 32,279 are marginal and 10,825 are landless. The total land utilization picture can be seen from the table listed below:

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Table 4.08: Showing the Land Utilization Pattern in the district

Land Utilisation				% of the total
1	Total Forest Area	Hect	134552	
2	Land Put on non agricultural uses	Hect	74289	19.60
3	Barren & Un-cultural Land	Hect	36807	9.71
4	Permanent Pastures and Grazing land	Hect	3560	0.94
5	Misc.tree crops.&Groves not included in net area shown	Hect	20616	5.44
6	Cultivable Waste Land	Hect	1586	0.42
7	Current Fallows	Hect	1159	0.31
8	Other Fallows	Hect	6757	1.78
9	Net Area Shown	Hect	99674	26.30
10	Area Shown more than once	Hect	42765	11.28
11	Gross Crops Area	Hect	142439	37.58
12	Total Geographics Area	Hect	379000	

Source: District Statistical handbook, 2009

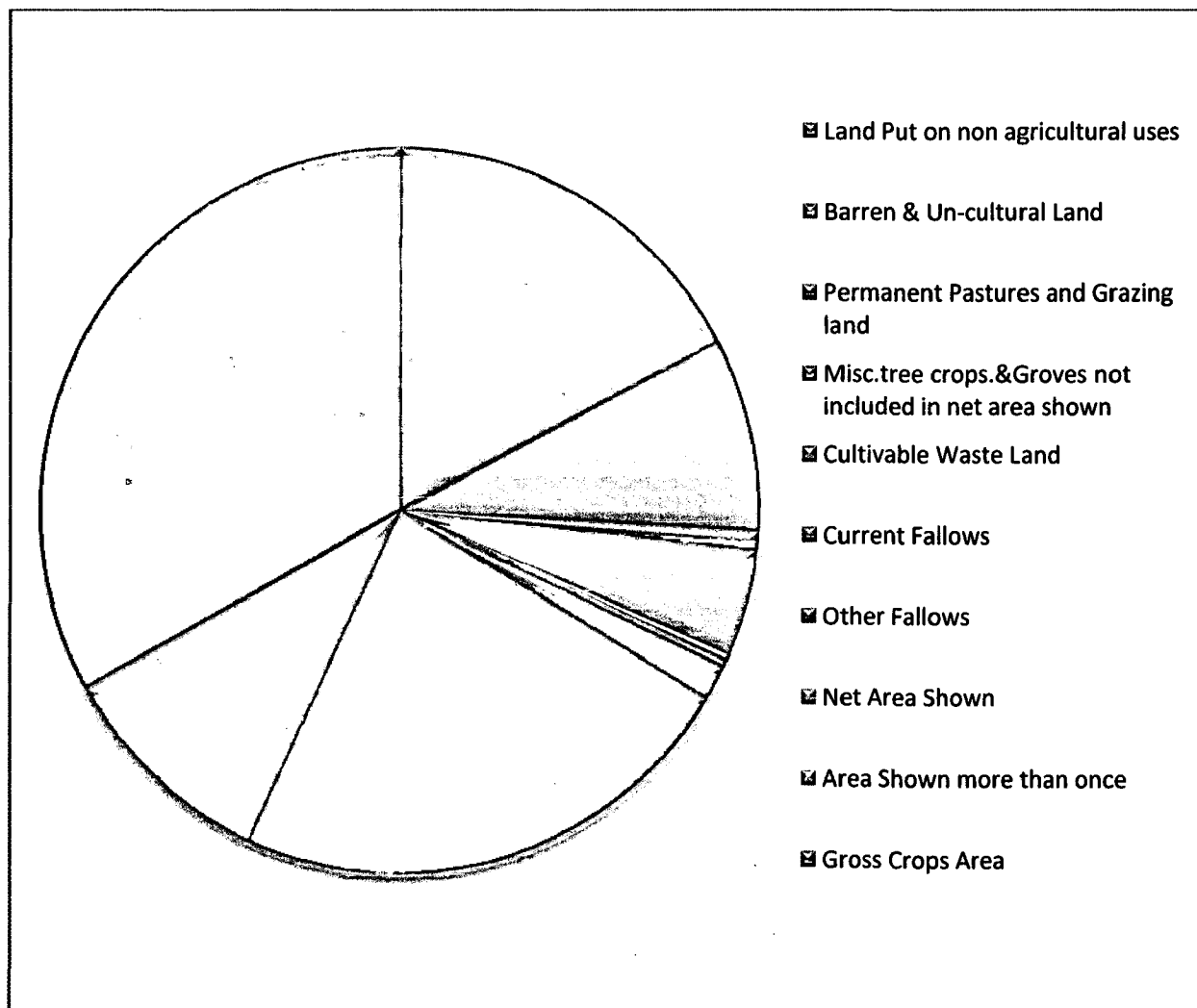


Figure 4.11: Showing the Land Utilization Pattern in the district

STUDY AREA PROFILE

Block	Geo-graphical area(Ha.)	Forest Area	Land under non-agri use	Cultivable waste	Permanent pastures	Land under miscellaneous tree crops and groves	Current Fallow	Other fallow	Net sown area	Gross cropped area	Cropping intensity (%)
Guijan	20996	225	1784	364	459	3074	415	256	6133	8218	134
Itakhuli	38760	7703	5841	415	380	4452	390	250	8112	10545	130
Hapjan	41666	23650	2410	423	261	137	0	280	14805	15734	106
Kakopathar	83200	87	5564	4993	20	1000	600	734	33400	72273	125
Saikhowa	24207	1062	3549	907	1394	4487	624	501	11683	14502	124
Margherita	12337	0	0	2438	0	0	695	0	23241	26617	114.5
Sadiya	79046.4	12575.2	0	1022	0	0	0	0	0	22335.5	136
Tinsukia district	304212.4	45302.2	19148	10562	2514	13150	2724	2021	97374	170224.5	869.5

SOURCE: C – DAP, District Agricultural Officer, 2009-2012

Figure 4.12: Showing Land Utilization Statistics of the CDB of Tinsukia

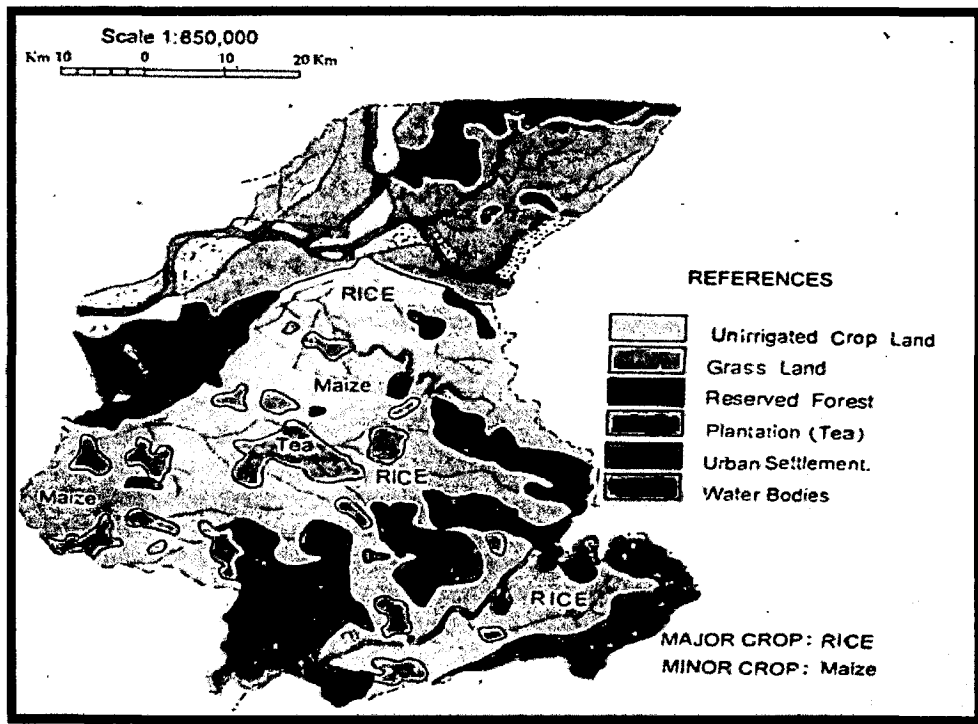
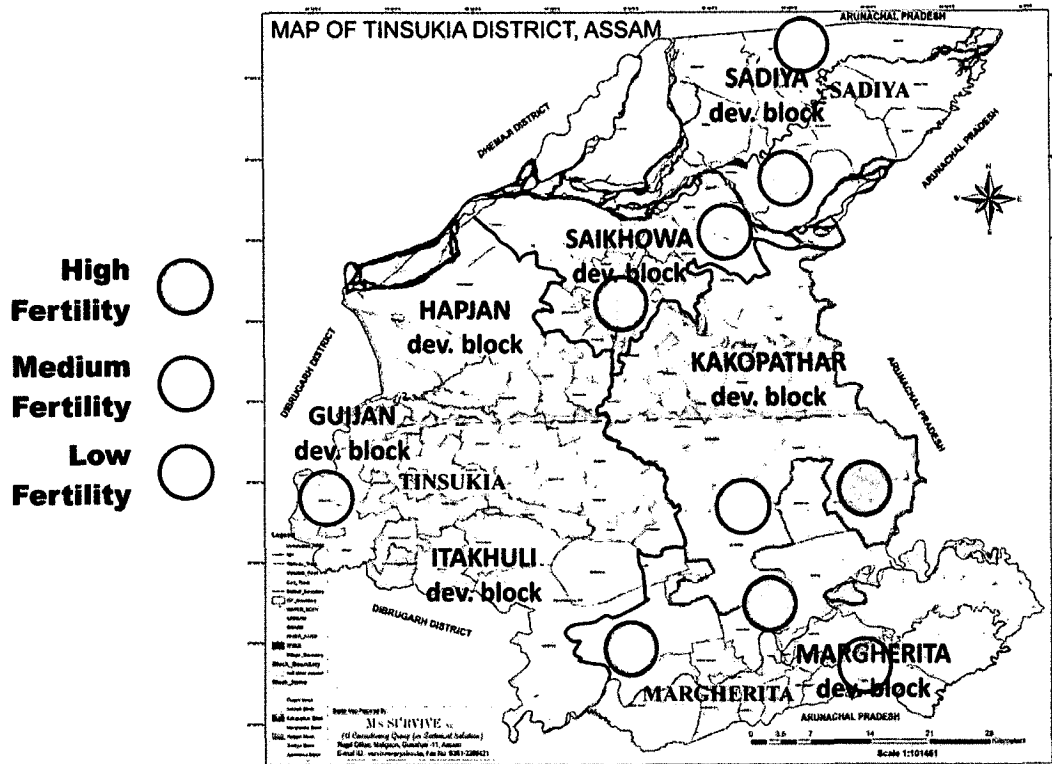


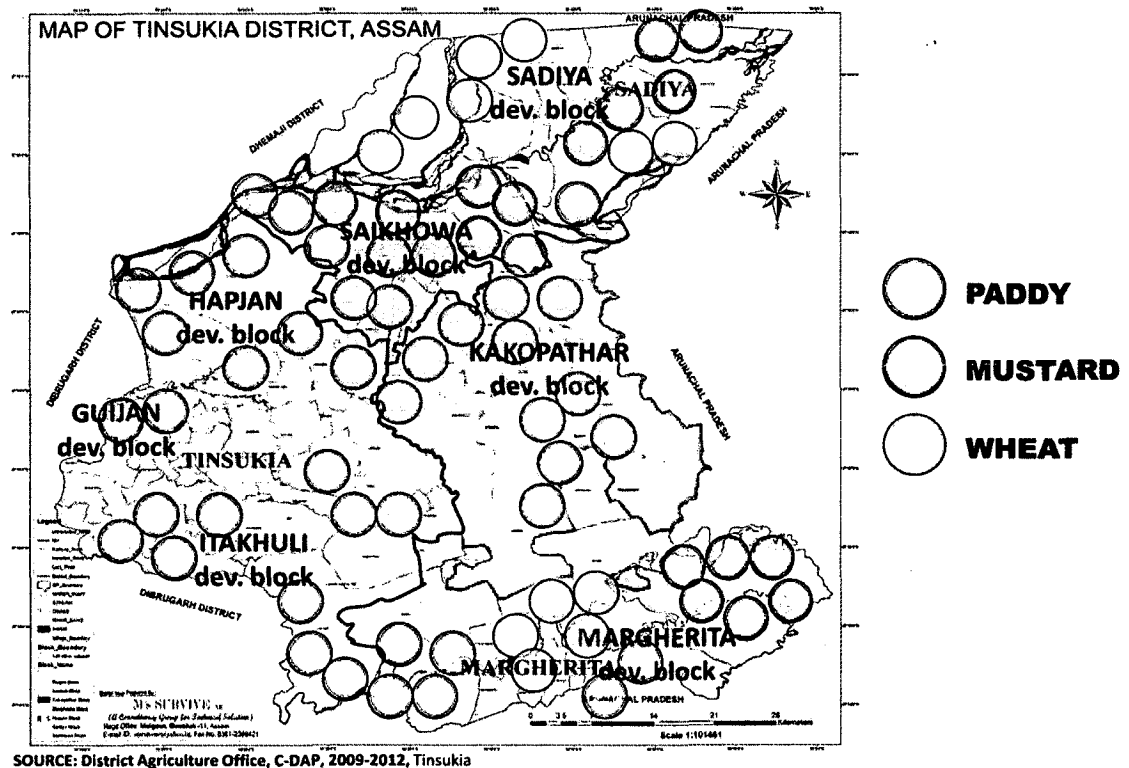
Figure 4.13: Showing General Land Use and Cropping Pattern of the District

STUDY AREA PROFILE



SOURCE: District Agriculture Office, C-DAP, 2009-2012, Tinsukia

Figure 4.14: Map of Tinsukia District Showing Soil Fertility Status



SOURCE: District Agriculture Office, C-DAP, 2009-2012, Tinsukia

Figure 4.15: Map of Tinsukia District showing various Crop Regions

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4.2.8 IRRIGATION AND GROUND WATER: The district has no major irrigation project. There are only medium, minor and lift irrigation projects which cover only 2.7% of the total cultivable area. So, the agricultural activities in the district are mainly rain fed. The district has abundant ground water resource which can be used very effectively as it is available at shallow depth almost all over the district. The ground water drops by few meters in the lean months.

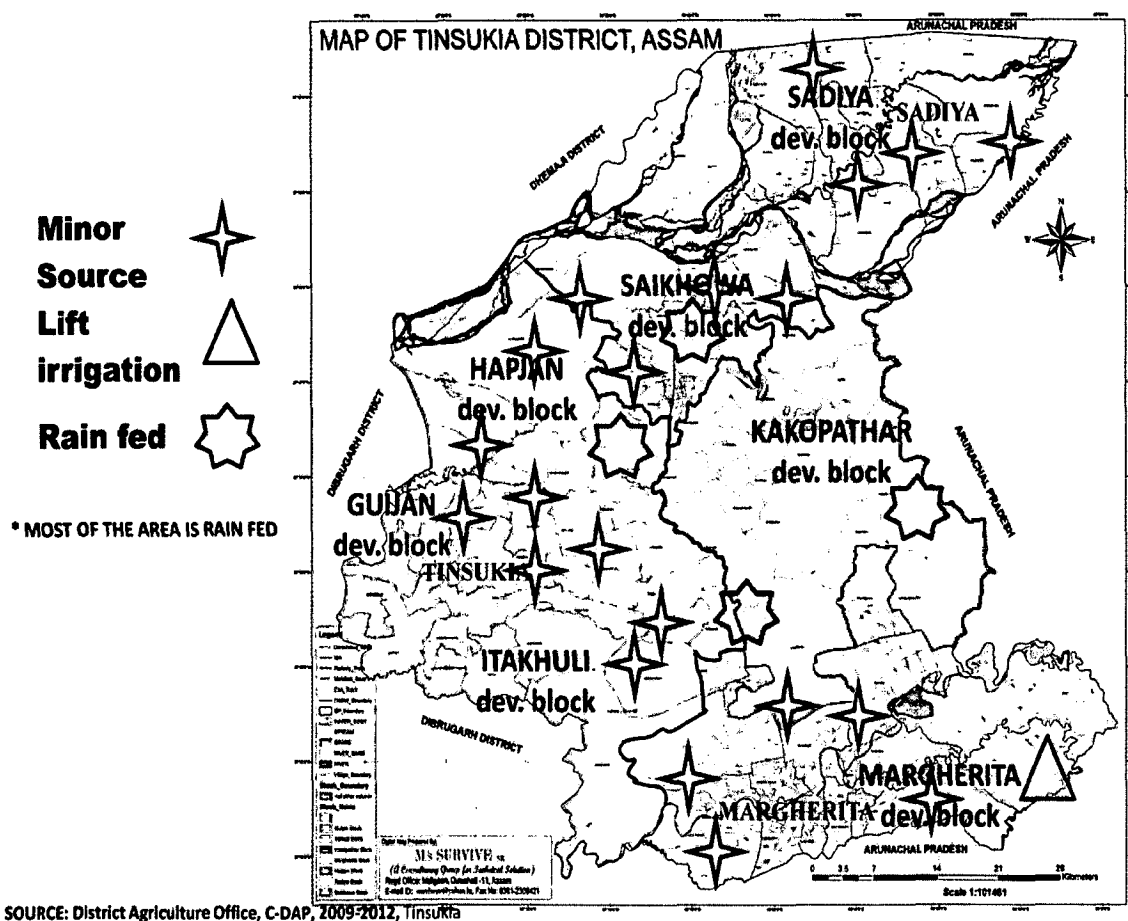


Figure 4.16: Map of Tinsukia District Showing Irrigated and Rain-fed Areas

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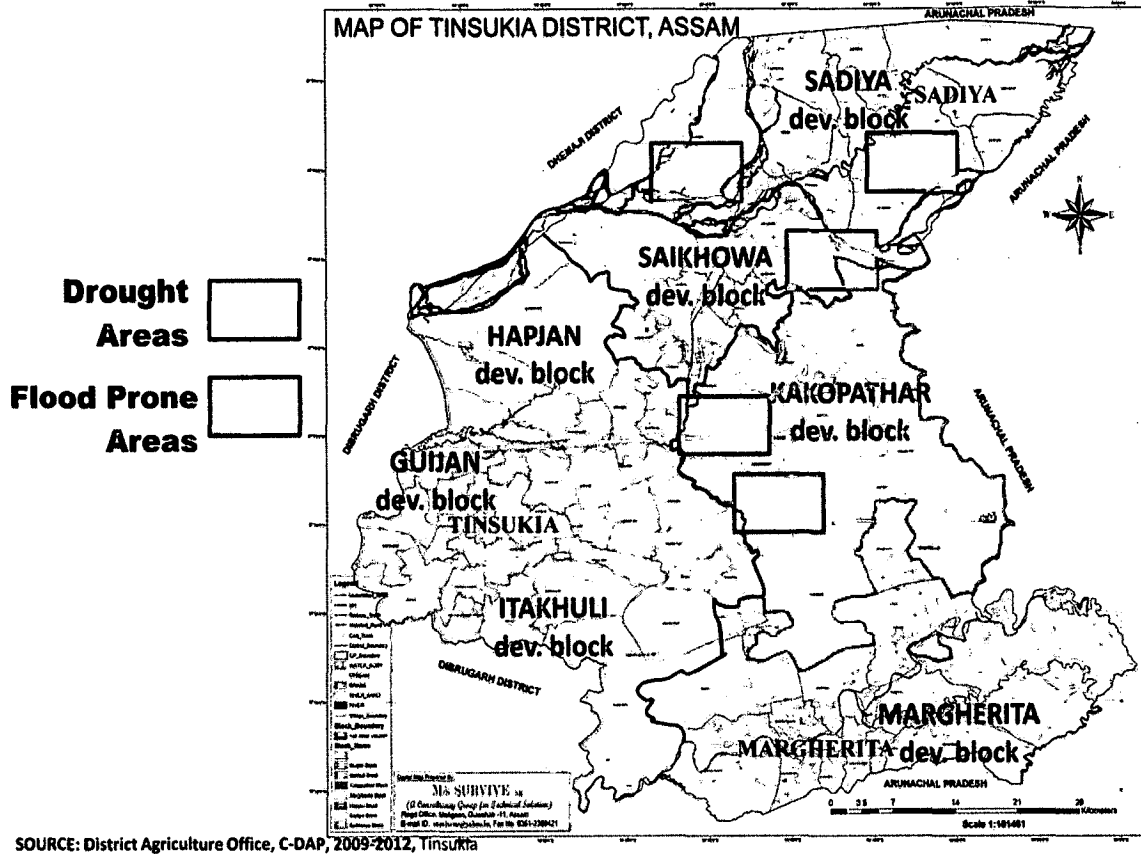


Figure 4.17: Map of Tinsukia District showing Drought/Flood prone areas

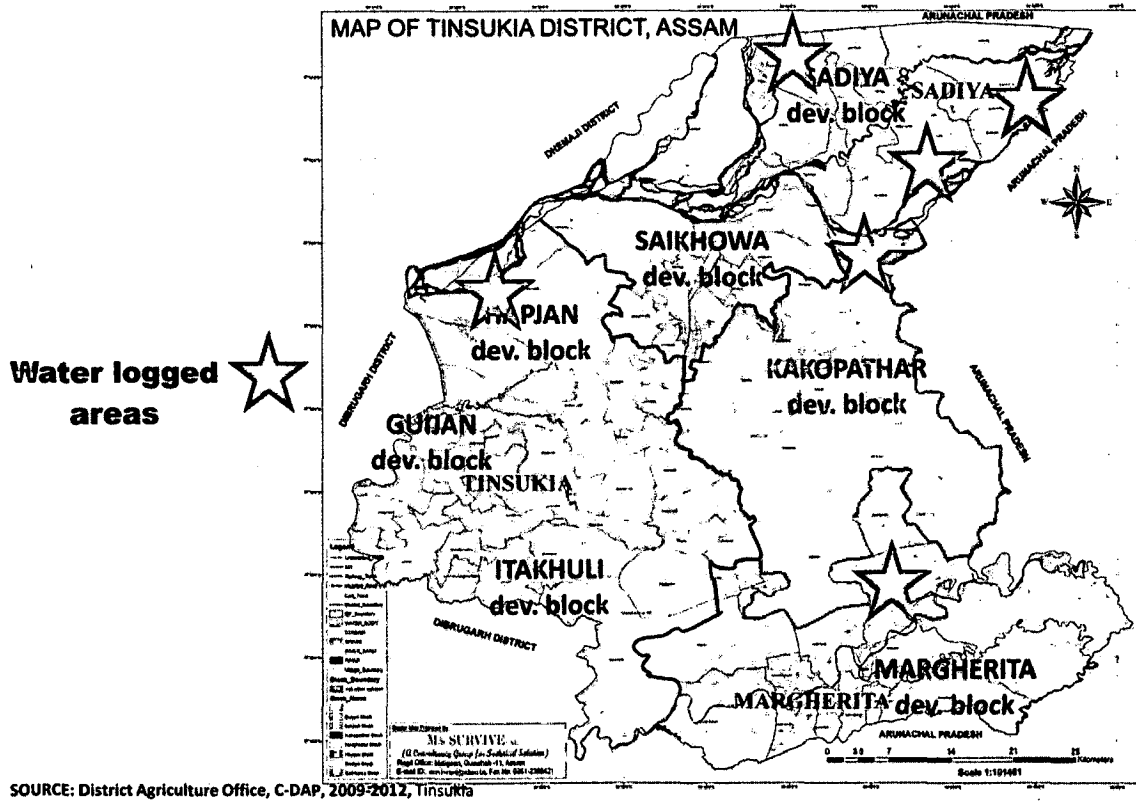


Figure 4.18: Map of Tinsukia District showing Water Logged areas

4.2.9 LINKAGES AND CONNECTIVITY

4.2.9.1 Roadways: All the major settlements of Tinsukia district are lying on the national and state highways. The district is well connected with road network. Three national highways NH – 37, NH – 38 and NH – 52 pass through the district connecting it with Arunachal Pradesh and Nagaland. State highways are also contributing in population distribution and all major settlements are connected via metalled road. Most often these roads due to heavy monsoons tend to crack and get damaged.

4.2.9.2 Railways: The North Frontier Railway has its junction at Tinsukia railway station which is an old station remodelled to a modern railway station. Railway contributes by transporting labour, passenger and goods.

4.2.9.3 Airways: The nearest airport connecting the district with the capital of the country and carious other places of India is in the Dibrugarh district which is 60 kilometres away from the Tinsukia town.

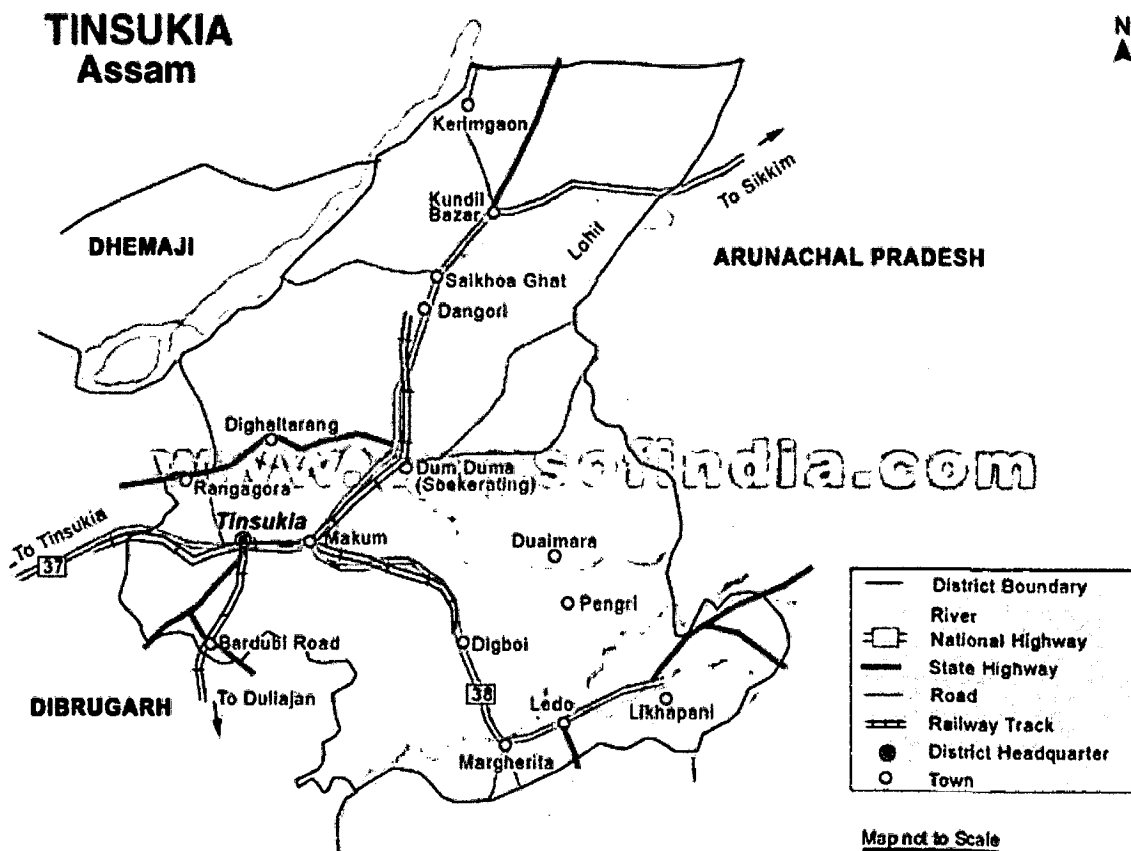


Figure 4.19: Map showing Linkage and Connectivity of the district

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4.2.10 LAND USE IN TINSUKIA REGION: The Master Plan of 1984 for Tinsukia municipality was evolved to provide for the physical growth and balanced development of the notified planning area through a series of intergraded land use zones specifying the uses. The Master Plan was made statutory on August 1982. The planning area covering an extent of 5260.512 hectares includes the municipal areas of Tinsukia and villages outside the municipal area. The details of the existing land use in Tinsukia Master Plan, 1984 is enlisted below:

Table 4.09: Showing the Existing Land use in Tinsukia Master Plan area, 1984

Sl. No.	Land-use	Municipal Area		Villages Outside Municipal Area		Master Plan Area	
		Area In Hect.	%	Area In Hect.	%	Area In Hect.	%
1	Residential	340.9	62.65	674.52	65.9	1015.42	64.77
2	Commercial	34.872	6.41	40.736	3.98	75.608	4.82
3	Industrial	49.46	9.09	42.46	4.15	91.92	5.86
4	Public Semi-public	38.892	7.15	103.34	10.1	142.232	9.07
5	Transport(road)	64.852	11.92	99.492	9.72	164.344	10.48
6	Railway Land	12	2.21	39.328	3.84	51.328	3.27
7	Parks & Playground	3.2	0.59	23.6	2.31	26.8	1.71
Total Development Area		544.176	100	1023.476	100	1567.652	100
8	Agriculture	299.39	23.4	2145.24		2375.22	
9	Vacant	189.824	19.3	402.836		592.652	
10	Tea Estate			672.72		672.72	
11	Water Bodies	19.54	1.98	19.208		38.748	
12	Defence			13.52		13.52	
TOTAL AREA		1052.93	100	4277		5260.512	

Source: Town and Country Planning, Tinsukia

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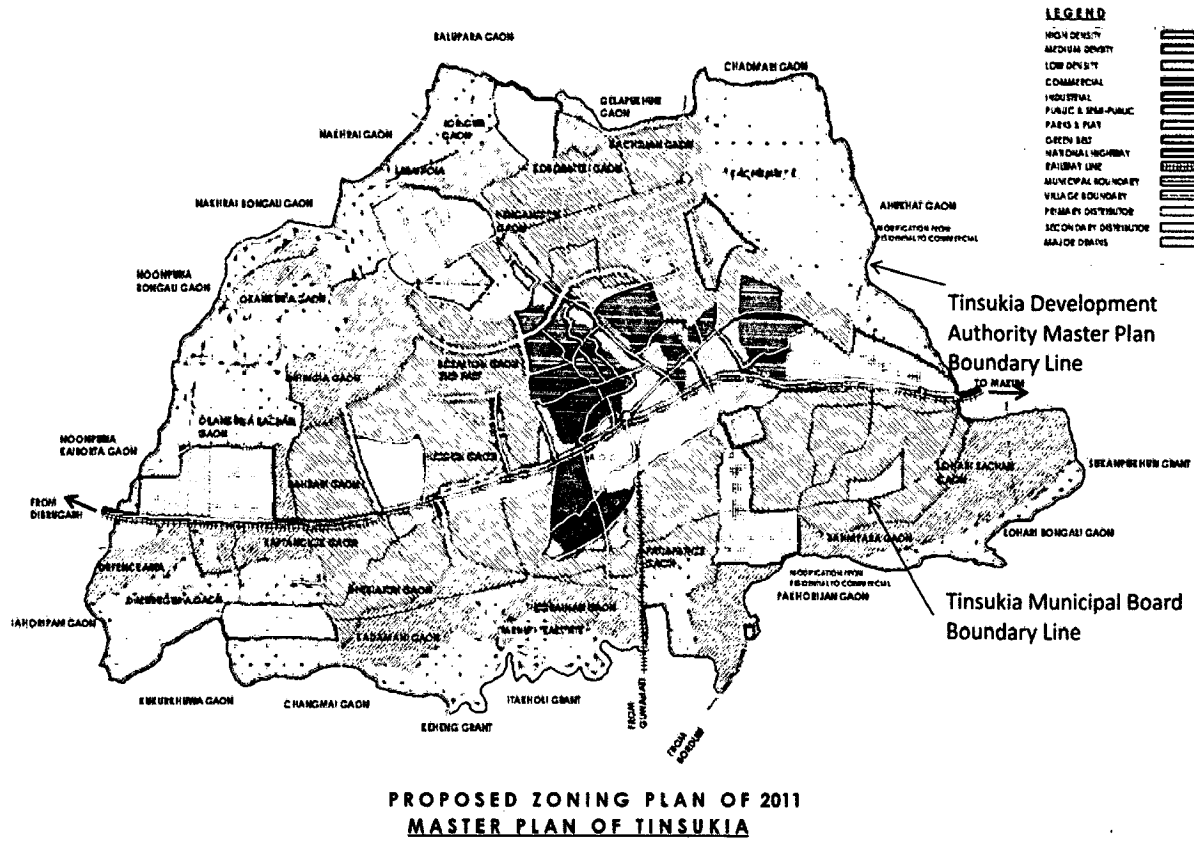


Figure 4.20: Showing Land Use Pattern in Tinsukia City

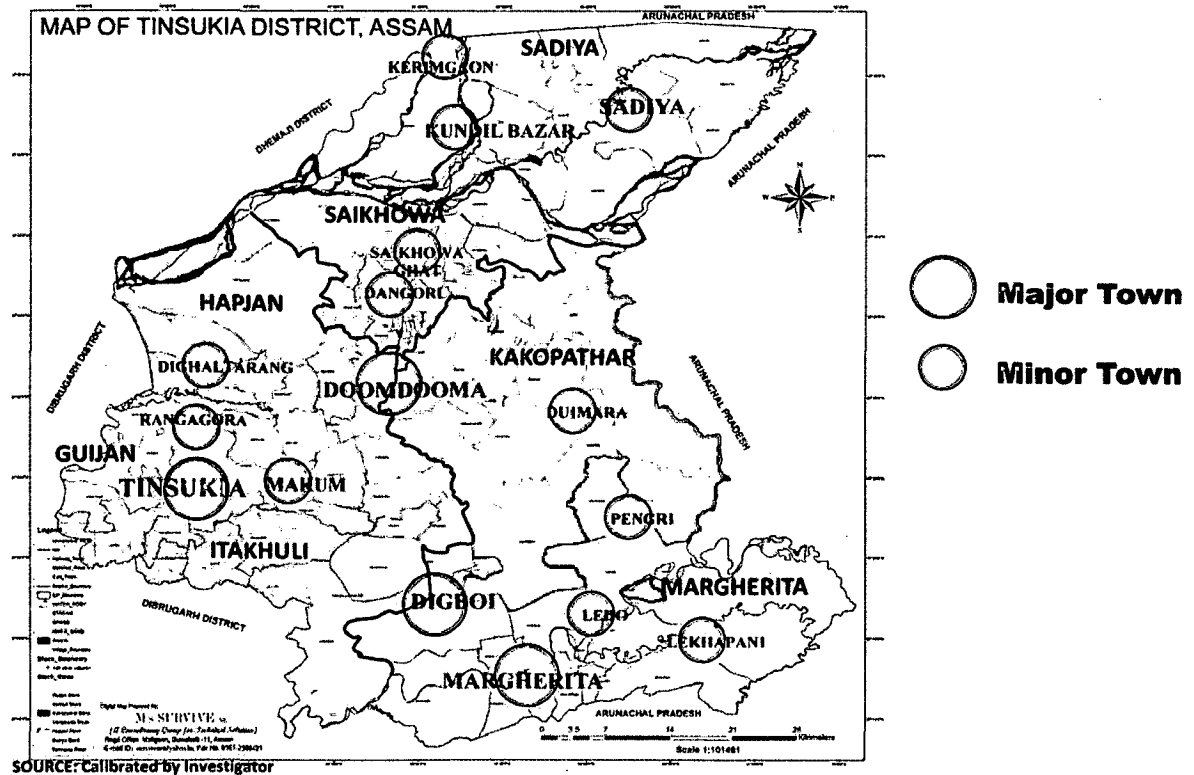


Figure 4.21: Map of Tinsukia District showing different Block Towns

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4.3 ECONOMY: In general, the primary and the secondary sector of the economy dominates developing countries, whereas, the tertiary sector dominates in the developed countries economy. The Indian economy is considered as developing one. The detail of GSDP and NSDP for the year 2006-2007 AND 2007-2008 is presented below:

Table 4.10: Movement of State Domestic Product of Assam

Year	GSDP (Rs. In Crores)		NSDP (Rs. In Crores)		Per Capita GSDP (Rs)		Per Capita NSDP (Rs)	
	At current prices	At Constant (1999-2000) Prices	At current prices	At Constant (1999-2000) Prices	At current prices	At Constant (1999-2000) Prices	At current prices	At Constant (1999-2000) Prices
1	2	3	4	5	6	7	8	9
2006-2007	63768.92	48437.49	57378.35	43781.79	22068	16763	19857	15152
2007-2008	70439.93	51372.05	62852	46432.61	24056	17544	21464	15857

Source: Statistical Handbook, Assam, 2009

Table 4.11: Gross State Domestic Product (GSDP) at Factor Cost by Industry of Origin, Assam

Gross State Domestic Product (GSDP) at Factor Cost by Industry of Origin, Assam				
Sector	2006-2007		2007-2008	
	At current prices	At Constant (1999-2000) Prices	At current prices	At Constant (1999-2000) Prices
PRIMARY	36.03	30.91	35.26	29.49
SECONDARY	17.88	16.9	17.8	16.41
TERTIARY	46.09	52.19	46.94	54.1
TOTAL GSDP	100	100	100	100
PER CAPITA GSDP (Rs.)	22068	16763	24056	17544

Source: Statistical Handbook, Assam, 2009

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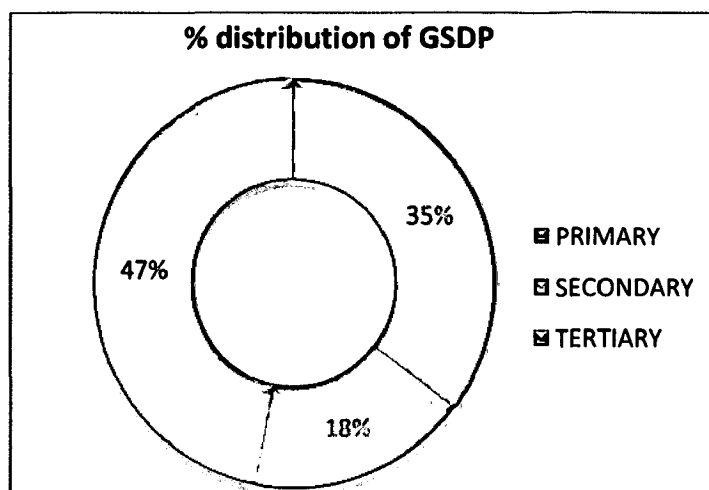


Figure 4.22: Gross State Domestic Product (GSDP) at Factor Cost by Industry of Origin, Assam

The GSDP of the state is 35 % from the primary sector whereas the GDDP of Tinsukia district from the primary sector is 10% more than the state, i.e., 45%. There is not much difference in case of the secondary sector. In case of GSDP it is 18% and the GDDP is 16%. In the tertiary sector too there is a huge difference between the state and the district. The states gross domestic product of tertiary sector is 47% whereas the gross district domestic product is 39%. This implies the primary sector has a toll over the state district wise. There is parity in the secondary but in the tertiary the GSDP is more than that of the district.

Table 4.12: Gross District Domestic Product (GDDP) at Factor Cost by Industry of Origin, TINSUKIA

Gross District Domestic Product (GDDP) at Factor Cost by Industry of Origin, Assam (2007-2008)		
Sector	2007-2008	
	At current prices	At Constant (1999-2000) Prices
PRIMARY	213948	108918
SECONDARY	74479	49958
TERTIARY	185514	157837
TOTAL GDDP	473941	316713
PER CAPITA GDDP (Rs.)	37006	24730

Source: Statistical Handbook, Assam, 2009

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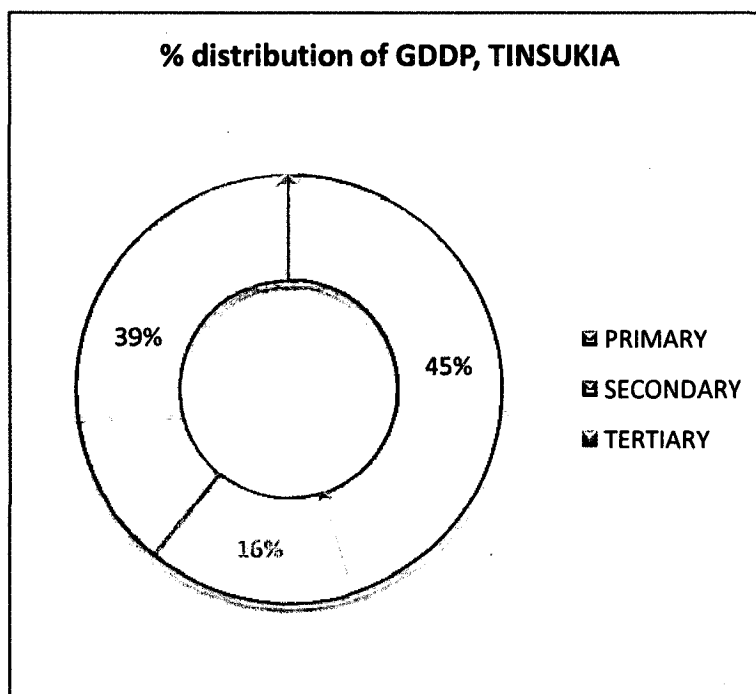


Figure 4.23: Gross State Domestic Product (GDDP) at Factor Cost by Industry of Origin, Tinsukia

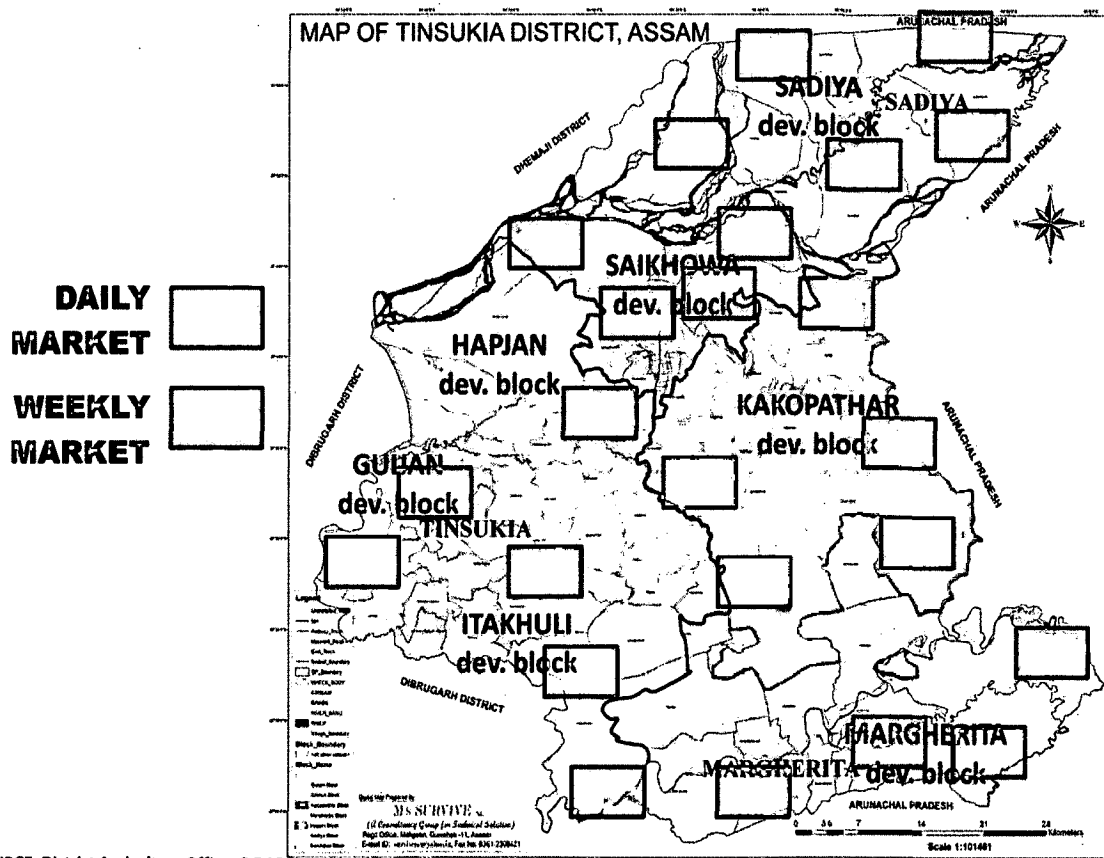


Figure 4.24: Map of Tinsukia District showing Market Density

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4.3.1 INDUSTRY: Industrial activities are very much essential for the development of the economy. The study area is having more industrial activities. The details of various categories of industry and growth of industries in Tinsukia district are presented below.

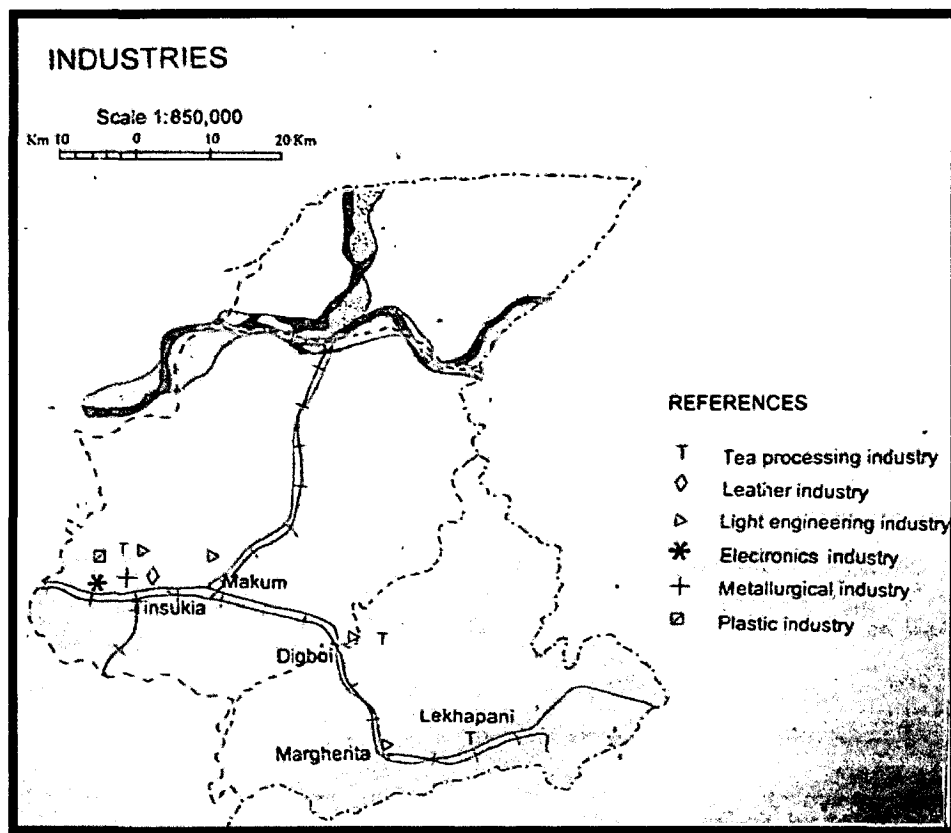


Figure 4.25: Map showing different Industries and their Location within Tinsukia district

Table 4.13: Details of Industries in Tinsukia district

District Industries and Commerce (2008)		
Sl.No.	Items	Particulars
1	Tinsukia Industrial Estate	
	Total area(sq.m)	149833
	No. of Sheds constructed	50
	No. of Alloted	50
2	Doomdooma Industrial Estate	
	Total area(sq.m)	749347
	No. of Sheds constructed	1
	No. of Alloted	1
3	Industrial Estate C/E	
	Total area(sq.m)	1622
	No. of Sheds constructed	10
	No. of Alloted	10
4	Small Scale Industries	2377

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5	No. of Registered Industries	103
6	No. of Industrial Estate	3
7	No. of sheds under Industrial Estate	50
8	No. of Commercial Estate	3
9	No. of sheds under Industrial Estate	19

Source: Statistical Handbook, Tinsukia, 2008

The details of various categories of industry and growth of industries in Tinsukia Region are presented in Table and in Figure respectively.

1. No. of Factories in Tinsukia district – 501 (as per NIC, 2004)
2. No. of Workers in Tinsukia district – 21,125 (as per NIC, 2004)
3. Total registered units (December, 2007) – 2025 / Workers = 543
4. Total registered units (December, 2008) – 2124 / Workers = 739

Table 4.14: Showing Industrial estates and other Infrastructure

(A) INDUSTRIAL ESTATE						
DISTRICTS	NAME OF INDUSTRIAL ESTATE	TOTAL AREA (in sq. mts)	No. of Shed Constructed	No. of Shed Alloted	No. of Shed Occupied	No. of Shed Functioning
Tinsukia	Tinsukia	149833	50	50	50	22
	Doomdooma	749347	1	1	1	1
(B) INDUSTRIAL AREA						
Tinsukia	Buraburi, Sadiya	267600	0	0	0	0
(C) GROWTH CENTRE						
Tinsukia	Talap	2676	3	3	3	0

Source: Statistical Handbook, Assam, 2009

Table 4.15: Showing Distribution of industry and workers with type of Industry

Industry Type	Industry	workers
Agro	27	309
Forest	4	63
Textile	14	50
Chemical	3	25
Engineering	29	188
Electronic	2	9
Mineral	3	31
Leather	1	3
Rubber/Plastic	1	5
Misc.	15	56

Source: Statistical Handbook, Assam, 2009

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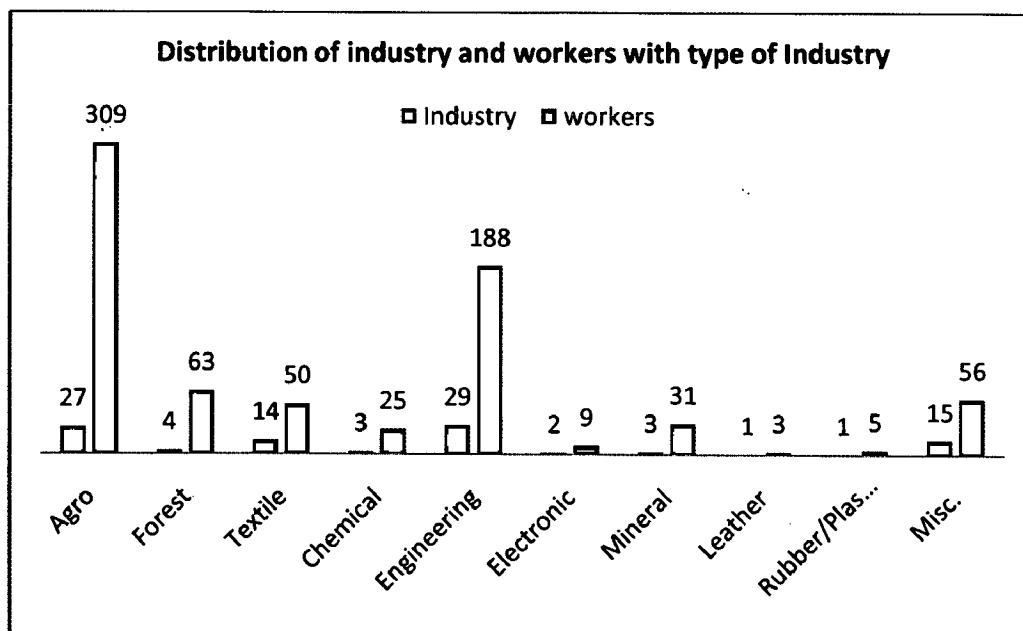


Figure 4.26: Showing Distribution of industry and workers with type of Industry

4.3.2 EMPLOYMENT: Employment is considered as one of the most important parameters and considered as the 'back bone' of the economy in the system. The employment opportunities in the primary, secondary, and tertiary sectors of the economy have been considered in this investigation, and have been observed that the secondary and tertiary sectors of the economy are functioning well in the system. It has been observed that almost half (50 percent) of the total population works in large establishments in the private sector and the second share is hold by people in the public sector in state government jobs.

Table 4.16: Employment through Employment Exchange

EMPLOYMENT THROUGH EMPLOYMENT EXCHANGE, 2008					
NAME	No. of Registration	No. of Live register	No. of Vacancy	No. of Placement	No. of ppl using Employment exchange
Tinsukia	15005	54163	117	36	20
Assam	228763	2006389	2383	628	288

Source: Statistical Handbook, Tinsukia, 2008

Table 4.17: Details of employment

SECTOR	YEAR - 2008	% of Total
(A) PUBLIC		

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Central Govt.	67795	6.27
State Govt.	309320	28.59
Central Quasi Govt.	88226	8.15
State Quasi Govt.	49368	4.56
Local Bodies	12571	1.16
(B) PRIVATE		
Large Establishment	545497	50.42
Small Establishment	9092	0.84
TOTAL	1081869	100.00

Compiled by the Investigator based on Directorate of Economics and Statistics, 2008, Assam

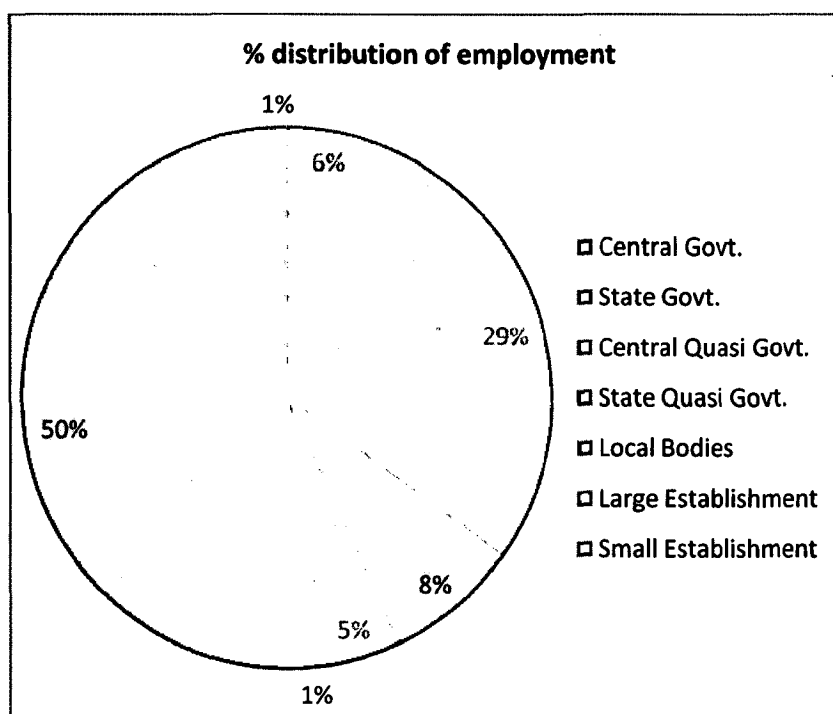


Figure 4.27: Details of employment

4.3.3 FISHERIES: The mighty Brahmaputra and its tributaries are the natural habitat of fresh water fishes. The fishery business in Tinsukia district is a huge hit and earns major revenue. The production growth rate of fish seed and fish in Tinsukia district is elaborated in the figures below.

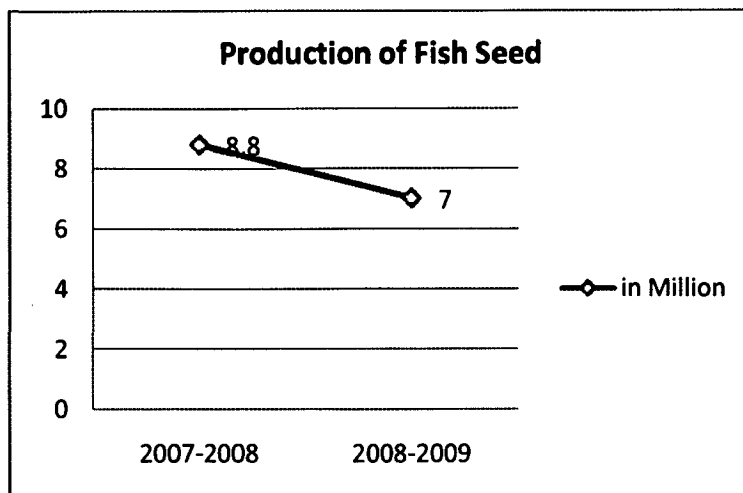


Figure 4.28: Details of Production of Fish Seed

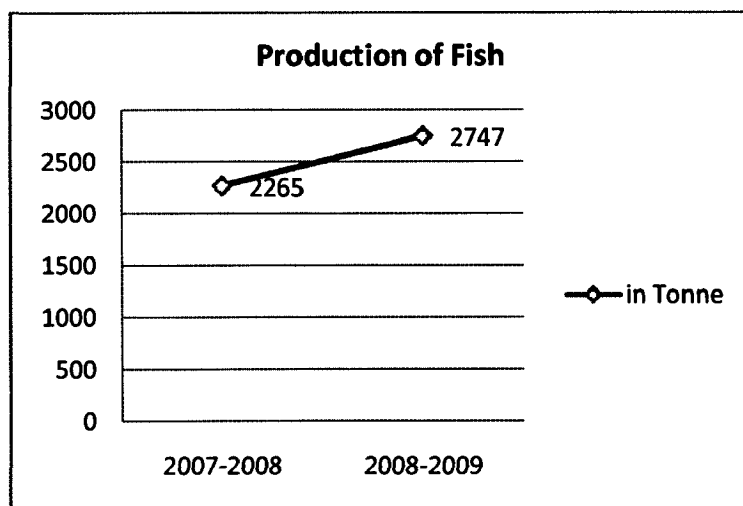


Figure 4.29: Details of Production of Fish

4.3.4 SERICULTURE: This is one of the prime units and source of income for the Tinsukia district. The silk produced is of world class and is exported to earn foreign exchange. The details of the sericulture industry of Tinsukia district is given below:

Table 4.18: Details of Production of Fish

Sno.	Item	Unit	Particulars
1	Sericulture		
	No of sericulture villages	No.	180
2	No of families engaged in		

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	Eri		1525
	Muga		213
	Mulberry		518
3	Total area under silk worm food plants	Hect.	
	Eri		8146
	Muga		116
	Mulberry		48.48
4	Yield cocoon		
	Eri	MT	1306
	Muga	Nos.	10282
	Mulberry reeling cocoons	MT	1242
5	Production of silk yarn		
	Eri	MT	9795
	Muga	MT	2056
	Mulberry	MT	0.116
6	No. of spring charkha sericulture farms and grainages in Tinsukhia District	Nos.	60
	a) Eri seed grainages	Hect.	13.38
	i) Total Area	Do	7.098
	ii) Area under plantation	Do	6.57
	b) Mulberry farms	Do	2.4
	i) Total Area	Do	
	ii) Area under plantation	Do	
	c) Basic Muga seed farms	Do	
	i) Total Area	Do	35
	ii) Area under plantation	Do	31
	iii) Production of Muga cocoons	Nos.	37000

Source: Statistical Handbook, Tinsukia, 2008

4.3.5 BANKING AND FINANCIAL INSTITUTIONS: Banking and other financial institutions play a vital role in the development of a particular system. The details of the Commercial and Regional Rural banks are listed below:

Table 4.19: Distribution of aggregate deposits and gross bank credit of reporting Commercial banks

<p>Distribution of aggregate deposits and gross bank credit of reporting Commercial banks of Tinsukia (in Crore)</p>

STUDY AREA PROFILE

Sl. No.	Item	2008	2009
1	No. of Reporting Offices	72	77
2	Deposits	1278	1574
3	Credit	527	622

Source: Statistical Handbook, Tinsukia, 2008

Table 4.20: Distribution of aggregate deposits and gross bank credit of reporting Regional Rural banks

Distribution of aggregate deposits and gross bank credit of reporting Regional Rural banks of Tinsukia (in Crore)			
Sl. No.	Item	2008	2009
1	No. of Reporting Offices	8	8
2	Deposits	34	34
3	Credit	13	15

Source: Statistical Handbook, Tinsukia, 2008

Table 4.21: Outstanding Credit of Scheduled Commercial Banks of Tinsukia according to Occupation

Outstanding Credit of Scheduled Commercial Banks of Tinsukia according to Occupation (in Lakh)		
Sl. No.	Occupation	(in Lakh)
1	Agriculture	6495
2	Industry	16524
3	Transport	746
4	Professional	1434
5	Personal Loan	22389
6	Trade	9250
7	Finance	180
8	Others	2632

Source: Statistical Handbook, Tinsukia, 2008

4.4 ENVIRONMENT: Environment is one of the most important parameters which decide the functions of the system. The environmental characteristics, such as, water quality, air quality, land quality, noise pollution and their quality are playing major role, in providing healthy living environment to the masses in the system. Growth of population, increase in number of vehicles, burning of solid waste in the open spaces and dumping of raw wastes in the open spaces unscientifically, excess fertilizers and pesticides use in agricultural lands, etc., are one of the major reasons for environmental degradation in the district. Normal air pollution caused due to vehicular movement on the road leads to generation of dust including suspended particulate matter (SPM) from the roads and emission of gaseous pollutants such as Sulphur Dioxide (SO₂), Oxides of Nitrogen (NO_x), Carbon Monoxide(CO) and Lead (Pb), from the exhaust of the vehicles. Apart from this, pollution also results due to spillage of diesel, petrol, lubricants, etc., on the roads. The recommended national ambient air quality standards should be maintained in the city for suspended particulate matter. Clogging and overflow of drains is observed in cities, now and then which cause overflow, due to the dumping of garbage, plastics, etc., into the gutter. The clogging of drain leads to foul smell and also provides conditions inevitable for breeding of vectors.

4.5 ECOLOGY: The ecological subsystem consists of many bio-subsystems. The communities (human and animal) and non-living environment function together and form an ecological system or ecosystem. Urban ecological subsystem consists of human population, animal population, birds, lakes and ponds, so they do have an autotrophic components or green belt.

STUDY AREA PROFILE

4.5.1 Dibru Saikhowa National Park: Dibru-Saikhowa National Park, encircled by rivers Brahmaputra and Dibru, is a river island nestled in the lap of Lohit, Dibang and Dangori rivers. Spread over an area of 765 sq. km with a core area of 340 sq. km, it is one of the 14 Biosphere Reserves of India. It enjoys a tropical hot and humid climate with evergreen and semi evergreen forests. Varied vegetation has provided excellent habitat for large numbers of faunal and floral species among which several are globally threatened and endangered. The Dibru-Saikhowa ecosystem is home to a wide range of animals including mammals, birds, reptiles, amphibians, fishes, butterflies and insects. The Park is the last critical refuge of many endangered species of birds like the White-winged Duck, Bengal Florican, White Rumped Vulture, Black Breasted Parrotbill, Marsh Babbler, etc. 25% threatened birds of India have been recorded in Dibru-Saikhowa. Destruction of habitats due to increasing human activities is the main threat to wildlife. About 10,000 people living in Laika, Pamua & Dodhia forest villages are largely dependent on the natural resources of the Park. Illegal felling of trees, clearing of grassland, killing of wildlife, excessive fishing, that too by poisoning and heavy grazing by about 20,000 domesticated cows and buffaloes kept in camps called Khutis inside the Park are serious challenges which the Forest Department has failed to face due to its organizational and infrastructural deficiencies. The Park area is vast, terrain is accessible only on foot, the numerical strength of Forest Guards is poor and resources are inadequate for conservation work. Conflict and distrust between people and Forest officials have limited the success of several conservation projects.

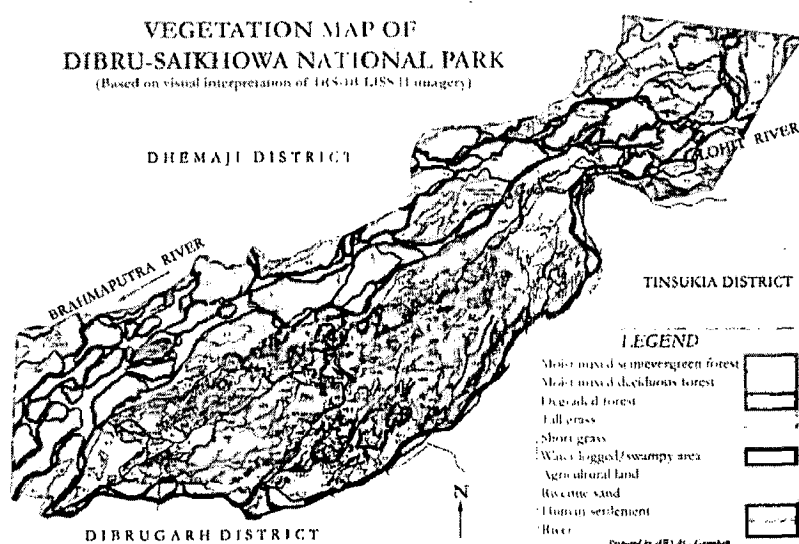


Figure 4.30: Vegetation Map of Dibru Saikhowa National Park

STUDY AREA PROFILE

4.5.2 Bio-diversity of Dehing Patkai Region: The Dehing Patkai region is bountifully rich in biodiversity. It falls under Indo- Burma hotspot, which is one of the twenty-five richest biodiversity hotspots of the world. The Indo-Burma hotspot comprises about 2 million square kilometers of tropical Asia, east of the Indian sub-continent. The region includes all of Cambodia, Laos, nearly the entire territories of Thailand, Myanmar and Bhutan, parts of Nepal, far eastern India and extreme south China, Hainan Islands in south China sea and Andaman Islands. The region is still revealing its biological treasures. Three-mammal species have been discovered in recent years. The hotspot has the world's highest diversity of fresh water turtle species. The Digboi forest division falls under Indo-Burma biodiversity hotspot and it is situated in between 27° 15' to 27° 30' north longitude and 95° 25' to 95° 45' east latitude. The Digboi Division is also integral part of the Dehing Patkai Elephant Reserve with total area of 609.55 sq.km. and a total of 160 wild elephants. Recently Dehing Patkai Sanctuary has been notified with the total area of 116 sq. km., consisting of Upper Dehing (West Block) Reserved Forests, Dirok and Joyopore.

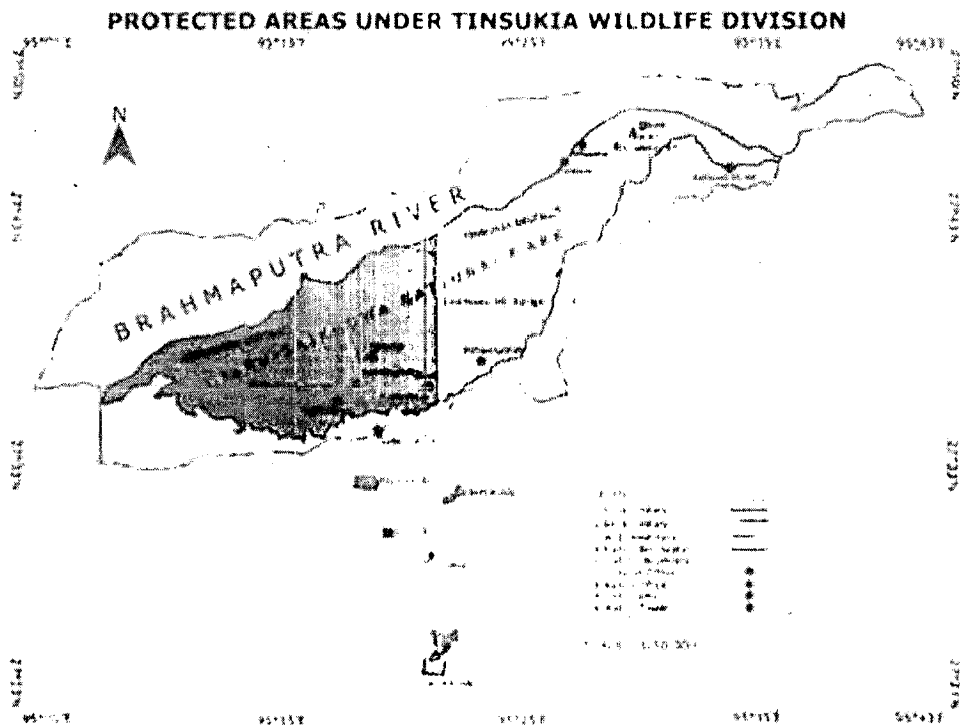


Figure 4.31: Showing Protected areas under Tinsukia Wildlife Division

4.6 PHYSICAL INFRASTRUCTURE

4.6.1 POWER: The consumption of power shows the growth and development of a particular system. It has been observed that there is strong correlation between per capita energy consumption and the gross domestic product in the system. This clearly indicates that energy is one of the most important factors, which is responsible for the development of the system. The number of electrified inhabited villages in Tinsukia district was 1107 (as per 2001 census). The latest survey (31st March, 2009) shows that 984 inhabited villages are electrified. There is extreme shortage of power in the district. In spite of the mighty Brahmaputra flowing length and breadth of the district, the district has dearth of power/ electricity.

4.6.2 WATER SUPPLY: Water supply and quality of water supply are also considered as important factor to assess the development of any system. The surprising element is there is no facility of water supply provided to the people by the local authority like Municipality, Nagar Nigam or Panchayat. The quality of water in most parts of the Tinsukia district ranges from bad to worst. The public works Department and two municipal agencies in the District are trying to incorporate the system of water supply in the district but till date no improvement is registered. The uneven geographical nature of the district leads to concentration of iron and minerals in many parts of Tinsukia. There is a dire urgency of centralized water supply to be maintained by the administration. Most households depend on individual motor-pumps, hand-pumps and wells.

4.6.3 DRAINAGE: Drainage is one of the important factors, which decides the functions of the system. Availability of adequate drainage in the urban system leads to healthy creates the healthy living environment. The predominant network in the Tinsukia urban agglomeration area is of pucca open type and these open drains are widened and closed recently. All the storm water drains discharge wastewaters into the low-lying areas, rivers and water bodies. The study reveals that the current drains are incapable of carrying the surface water especially in the monsoon seasons. The system has to be redesigned to meet the future requirements for increasing population.

The areas uncovered with drains should also be provided with storm water drainage facilities and the coverage area of existing system should be extended, especially in the urban area.

4.6.4 SOLID WASTE MANAGEMENT: Management of municipal solid waste is another important task now days and the municipal administration face a severe threat due to accumulation of wastes and generation of its associated problems in the urban system. Analyses across countries over time reveal that the generation of municipal solid waste is positively related to variations in per capita income and that the generation of municipal solid waste per capita does not vary with population size among countries but vary with comparable per capita income. Most of the solid waste is dumped in the open grounds. Irregular collection of solid waste from the households has to be regularized. Participation of private agencies should be encouraged for collection, storage, transportation, and finally recycling and dumping of waste.

4.6.5 ROADS: The roads form a basic part of the physical infrastructure of any system. The quality, maintenance and area connected by roads play a significant role and are a measure of development of a district. The total length of roads of Tinsukia district is 1099 km. The table and figure mentioned below gives us a fair perception that of the total available road length, rural roads comprises of the maximum. It can be determined from the figure that three fourth part (74 per cent) of the total are rural roads, 15 per cent are the major district roads, 6 per cent and 5 per cent are state highways and urban roads. This is a good sign which indicates that many rural and interior areas are connected by road infrastructure which makes the provision and distribution of services from distant areas easy.

Table 4.22: Category wise length of Road under PWD in Tinsukia (2008-2009)

Category wise length of Road under PWD in Tinsukia (2008-2009)	
State Highway	63
Major District Road	171
Rural Road	814
Urban Road	51
Total	1099

Source: Statistical Handbook, Tinsukia, 2009

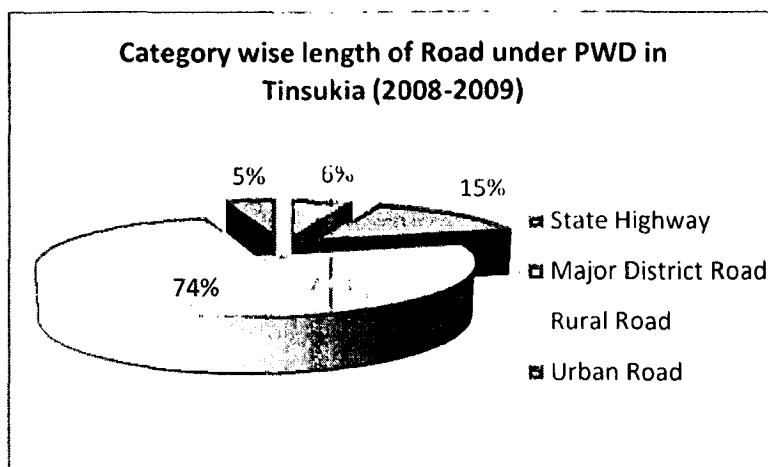


Figure 4.32: Percentage distribution of Length of Roads in Tinsukia, 2008-2009

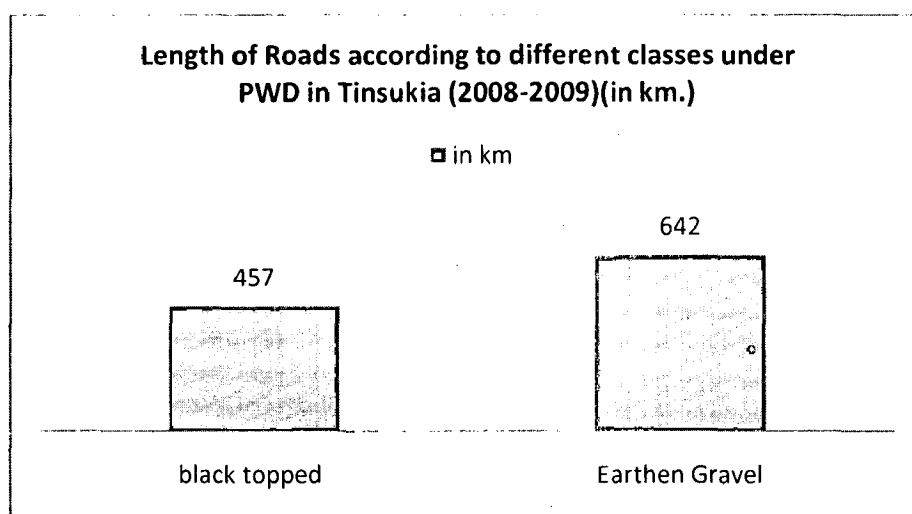


Figure 4.33: Length of Roads according to different classes under PWD in Tinsukia (in km.), 2008-2009

Table 4.23: Length of Road per Lakh of Population and per '00 sq km of Geographical area of Tinsukia (2008-2009)

Length of Road per Lakh of Population and per '00 sq km of Geographical area of Tinsukia (2008-2009)	
Tinsukia Road Length	1099
Road Length per Lakh of Population	95.6
Road Length per '00 sq km of Geographical area	29

Source: Statistical Handbook, Tinsukia, 2009

Table 4.24: Habitation Connectivity Status from Phase I to Phase VI, works progress by PMGSY, Tinsukia, 2009

Habitation Connectivity Status From Phase I to Phase VI, works progress by PMGSY, Tinsukia, 2009			
No. of Villages			
(1000+)	(500+)	(250+ and <250)	Total
74	52	49	175

Source: Office of the Chief Engineer, PWD (PMGSY Works)

4.7 SOCIAL INFRASTRUCTURE: The Investigator considered social infrastructure, such as, education, health, transportation, communication, and tourism for the present investigation since they play a vital role in the system, and are presented in the following sequel:

4.7.1 EDUCATION: Education is one of the most important parameters, which decides the functions of the system. The level of education in the district is poor. Although the total number of literates in the district is more than the national average but the quality of education is still backward. This is due to the less number of higher educational institutes in the area. Most students migrate to different states after secondary and higher secondary graduation in search of quality education in the field of medicine, engineering, technology, etc. The tables listed below are the comprehensive record of the number of institutes, students, teachers, etc. in the educational department.

Table 4.25: Number of Educational Institutes in Tinsukia District

Sl.no	Particulars	Education facilities	
		No. of villages where the facility is	
		Available	Not available
1	Number of primary schools	936	171
2	Number of middle schools	246	861
3	Number of secondary schools	81	1,026
4	Number of senior secondary schools	5	1,102
5	Number of colleges	7	1,100
6	Number of adult literacy class/centres	19	1,088

STUDY AREA PROFILE

7	Number of industrial schools	0	1,107
8	Number of training schools	1	1,106
9	Number of other educational schools	1	1,106

Source: Statistical Handbook, Tinsukia, 2009

Table 4.26: Details of Educational Institutes in Tinsukia District

Sl. no	Item Details	Particulars
1	No. of Primary School	839
	No. of Student	
	Boys	41934
	Girls	40794
	No. of Teacher	
	Male	1363
	Female	876
2	No. of Middle School	154
	No. of Student	
	Boys	19856
	Girls	18491
	No. of Teacher	
	Male	874
	Female	348
3	No. of High School	46
	No. of Student	
	Boys	13506
	Girls	12837
	No. of Teacher	
	Male	559
	Female	444
4	No. of Higher sec. School	18
	No. of Student	
	Boys	1352
	Girls	1301
	No. of Teacher	
	Male	72
	Female	78
5	No. of Junior colleges	10
	No. of Student	
	Boys	848
	Girls	723
	No. of Teacher	
	Male	62
	Female	48

Source: Statistical Handbook, Tinsukia, 2009

STUDY AREA PROFILE

4.7.2 HEALTH: Health is also one of the most important parameters since it plays major role in human resources development of a particular system. The details of the health infrastructure are listed below in the table.

Table 4.27: Number of Medical Facilities in Tinsukia District

Sl. no	Medical facilities		
	Particulars	No. of villages where the facility is	
		Available	Not available
3	Number of unani hospital	0	1,107
4	Number of homeopathic hospital	0	1,107
5	Number of allopathic dispensary	6	1,101
6	Number of ayurvedic dispensary	0	1,107
7	Number of unani dispensary	0	1,107
8	Number of homeopathic dispensary	0	1,107
9	Number of maternity and child welfare centre	26	1,081
10	Number of maternity home	0	1,107
11	Number of child welfare centre	1	1,106
12	Number of health centre	13	1,094
13	Number of primary health centre	23	1,084
14	Number of primary health sub-centre	69	1,038
15	Number of family welfare centre	0	1,107
16	Number of T.B. clinic	0	1,107
17	Number of nursing home	0	1,107
18	Number of registered private medical practitioners	0	1,107
19	Number of subsidised medical practitioners	1	1,106
20	Number of community health workers	0	1,107
21	Number of other medical facilities	0	1,107

Source: Statistical Handbook, Tinsukia, 2009

4.7.3 TRANSPORT: The details of the road transport in Tinsukia district is given below. It can be concluded from the figure that the percentage of 2-wheeler and car movement in the district is maximum as compared to other vehicles. The number of rural transport is very feeble and needs to be boosted for the successful and smooth functioning of the system. Various projects and aids by JNNURM should be incorporated to uplift the public transport and rural transportation system in the district. The revenue collection under commissioner of transport, Tinsukia district authority was Rs. 7.79 crore in 2007-2008 which rose to Rs. 8.47 crore in 2008-2009.

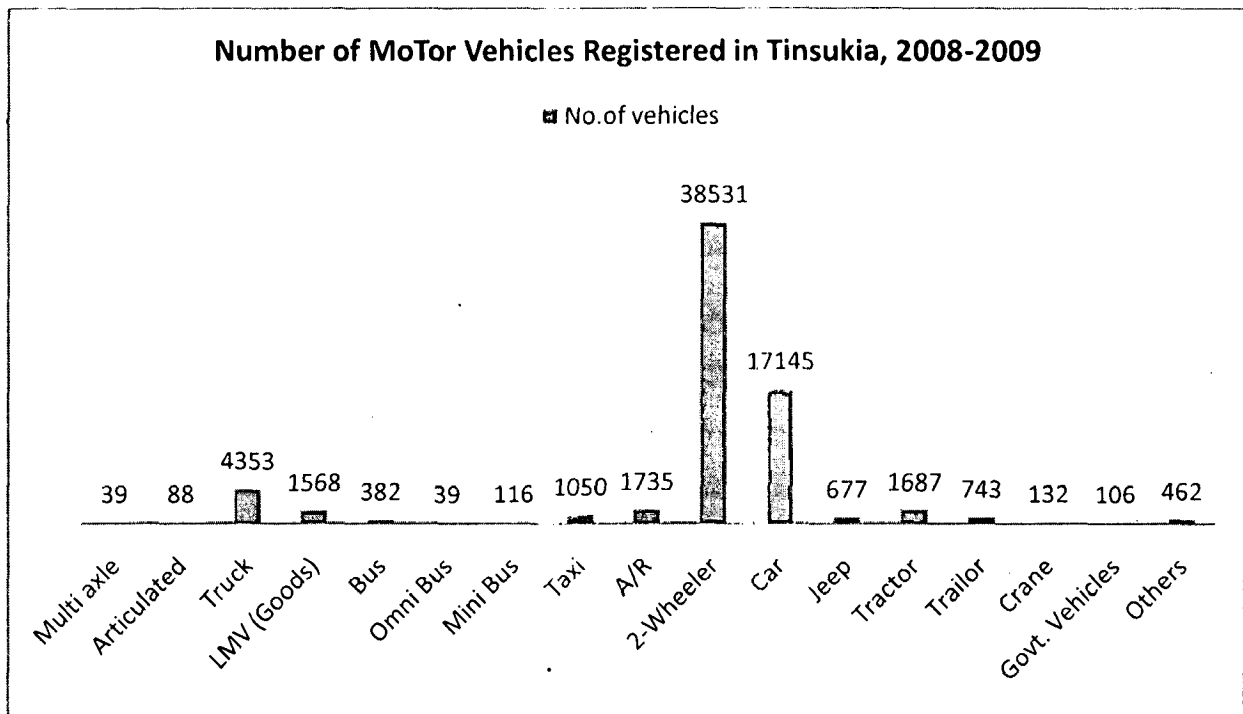


Figure 4.34: Number of Motor Vehicles Registered in Tinsukia, 2008-2009

4.7.4 COMMUNICATION: It is a one parameter which can define the richness and development quotient of any district. Better communication and connectivity leads to road to success. Rapid information system results in the fast growth of any system. The villages of Tinsukia district are well connected by Rural Telephone Connection, fixed lines, WLL and MTS. All major centres have PCO, STD and ISD facilities. Now a day, mobile (prepaid and post paid) connections are a rage among the people of the district. Out of 1162 villages in the district, 1107 inhabited villages have the facility of letter boxes. The details of the number of post offices in the district have been listed in the table below.

Table 4.28: Habitation Connectivity Status from Phase I to Phase VI, works progress by PMGSY, Tinsukia, 2009

District	No. of Post offices			Total area serves per Post office (in sq km)		Population served per PO		No. of villages with PO
	Rural	Urban	Total	Urban	Rural	Urban	Rural	
Tinsukia	121	20	141	2.07	31.23	11207	7715	121

Source: Statistical Handbook, Tinsukia, 2009

4.7.5 FIRE STATIONS: There are four fire stations in the Tinsukia district. These are located at the main towns namely Tinsukia, Doodooma, Digboi and Margherita. These fire stations are working effectively for the fire exigency of the study area.

4.7.6 CREMATION YARD AND BURIAL GROUNDS: The district has several burial grounds, which are confined to particular Religious Institutions and some of them are located even within the core of city area.

4.7.7 TOURISM: Tourism is considered as one of the important activities for economic development in the study area. This district can be well developed on the lines of tourism as it has enormous biodiversity and many wildlife sanctuaries. Eco-Tourism can be promoted in this region. This region also is the gateway to the virgin Arunachal Pradesh which has been crafted by the almighty in leisure. The tourism business is potent to earn huge revenue if developed properly.

4.8 INSTITUTIONS: The State Government's line departments continue to play a crucial role in urban basic service delivery. Sectors and agency involvement include:

4.8.1 Public health engineering, Tinsukia: The Public Health Engineering Deptt. provides drinking water to the public through piped water supply schemes and by installation of spot sources. The Tinsukia (PHI) Division also provides potable water to the public by house connection from PWS Scheme through the village level committee to look after the piped water supply schemes, and earn revenue as water charges. The Department with the sponsorship of Human Development creates awareness among rural people on cleanliness and hygiene training on hand pump mechanic, water quality surveillance etc. The Low Cost Sanitary latrine is provided to the people below poverty line.

4.8.2 Tinsukia Development Authority, Tinsukia:

The Tinsukia Development Authority was constituted in the year 1963 under the provision of Assam T&CP Act, 1959 (As amended) and rules made there under.

The main purpose and function of the Authority is to encourage planned growth of the town controlling the development in accordance with the provision of the zoning regulation published by the Govt. in order to have a balanced development in the master plan area for Tinsukia so that, the town can accommodate additional population that contributes a lot in the process of urbanisation without affecting infrastructure and civic amenities.

The Master plan area of Tinsukia is about 52.6 Sq. Km. (5260.52 Ha) which consists of 29 nos. of town sheets and 23 nos. of villages.

As per provision of the Assam Town & Country Planning Act and rules these under, no person shall use any land, sub-divided any land by the way of transfer, gift, sale, partition or any other manner the whole or any part of the land or setup and new structure on any land covered in the master plan without the perior approval of the Authority. Moreover, change of existing structure by allocation of material renovation etc. is to be carried with the approval of Authority.

In addition to the above duties, the Authority at present is constructing a modern Commercial Complex as per recommendations of the master plan near A.T. Road at the site of Old Excise Ware House. Tinsukia with financial loan from HUDCO's. The proposed three stories market complex is designed with modern architecture in such a way that it can be the most attractive shopping cum commercial centre in the region. It is planned to provide ample parking space for motorised vehicles which will greatly relieve the existing traffic congestion in the heart of the town.

4.8.3 District Rural Development Agency: District Rural Development Agency, Tinsukia has been established on 1st April, 1992. Though Tinsukia District falls under the Industrial Belt with Coal belt at Margherita, green Tea gardens covering almost whole of the District, one of the oldest Oil Refinery of Asia located at Digboi, Recent BPL survey reveals that 41.31% of the Rural Population is falling under below poverty line. Therefore District Rural Development Agency, Tinsukia has taken various rural development schemes in different block development areas, for socio-economic development of rural People.

4.8.4 Department of Handloom and Textile: The Department of Handloom and Textiles, Tinsukia, under the Administration control of Directorate of Handloom and Textiles, Govt. of Assam is implementing the under mentioned schemes for the welfare and livelihood of the Weavers. There are 36,000 Handlooms in Tinsukia District, but among those a few handlooms are used for commercial purposes, 70% handlooms are traditional.

4.8.5 Office of the Superintendent of Sericulture: Sericulture industry today occupies a place of pride in the rural economy of the state of Assam. Assam has time honoured silk tradition and rich serigenous fauna. Being situated on the border areas of Arunachal Pradesh, the soil texture and climatic conditions of Tinsukia district is more favourable for the growth of Sericulture industry. It is an effective tool for the growth of Sericulture industry. It is an effective tool for rural development as it generates income and employment. Out of the villages in the district of Tinsukia, sericulture is practiced in about 287 villages providing employment or indirectly to about 6079 most of whom are from the weaker sections of the society including schedule caste and schedule tribes.

4.8.6 Public Works Department, National Highway Division, Dibrugarh:

National Highway in Assam is the main backbone in the communication system in the state. The portion of the Highway in the eastern most region of the country is having added importance for the fact that the Railway system is grossly inadequate. The railway network avoiding the main important towns and habitation areas. For this reason the National Highways have to play the most vital role in transporting the essential commodities, life saving medicines to this region together with the eastern sector of Arunachal Pradesh.

Certain stretch of NH-37, NH-38 and NH-153 in this region are very much distressed as no overlays etc. were laid since its first improvement in sixties resulting in difficulties for proper upkeep and maintenance of the same.

National Highway repair works are assessed by the MORT & H as per necessity. But these works are suffering for want of fund. Considerable amount liabilities are getting accumulated and subsequently the repair could not be completed in time. Due to which the road surface is deteriorating day by day.

STUDY AREA PROFILE

Considering the importance and vital role of the Highways in this region is required to play, special significance is necessary to be paid for Highways if needs to be on special consideration.

In the absence of **Bye-Passes at Dibrugarh and Tinsukia**, the Urban Link portion of the National Highway have long been catering the entire NH traffic, which got increased manifold during the last few years. In addition, due to improper drainage facilities, several stretches got submerged due to rain water during rainy seasons.

The MORT & H, Govt of India has also earmarked Rs. 3.00 crores for L.A. estimate of Tinsukia Bye-pass has in the Annual Plan for 2002-03. The alignment of Tinsukia Bye-pass has already been approved and accordingly the L.A. estimate has prepared by the District Magistrate, Tinsukia. The same has been submitted to the MORT&H, New-Delhi by the Chief Engineer, P.W.D. (NH Works) Assam in November'2002 and sanction from MORT&H awaited.

CHAPTER – 05

**DYNAMIC FEATURES OF THE
STUDY AREA**

5.1 PRIMARY DATA: Primary data is collected directly from the study area. This data can be collected by surveying the households in the study area by employing questionnaires/schedules, which can be filled by the investigator or enumerator. The queries in the questionnaire or schedules can be prepared based on the objectives of the investigation.

5.1.1 Household Survey: For household survey, sampling technique was employed. Sampling technique is followed to identify the samples, in a required amount, out of the total population. Thus, sample is a part of the total parent population, which is taken to get a fair picture of the total village. Random sampling technique was used, wherein a sample of the households were selected. A total of 100 households were sampled, out of the total 1162 villages. The tool employed for the data collection is by using schedules. The investigators collected the data in person from the individual respondents by interviewing them about the data as specified in the schedules.

5.1.2 Survey analysis: Amongst the 100 households chosen, 30% survey has been carried out in 3 important urban area/towns and rest 70% survey has been done in the rural areas to get a cumulative scenario of the system. The sample of 100 households taken for survey incorporated the following queries:

- No. of Persons in family.
- Age group of the household.
- Marital status.
- Education profile of households.
- Occupational structure.
- Monthly income
- Monthly expenditure.
- Monthly savings.
- Quantity of energy consumption.
- Monthly expenditure on energy consumption.
- Age of house, no. of rooms and no. of floors.
- Housing condition.
- Finance availability for house construction.

DYNAMIC FEATURES OF THE STUDY AREA

- Availability of household appliances.
- Vehicles owned.
- Condition of road.
- Maintenance of roads.
- Proximity of work activity, educational, medical, market and recreational activities.
- Water supply.
- Electricity.
- Sewerage.
- Drainage.
- Land holding size
- Cropping pattern.
- Area under different crops.
- Production, consumption and surplus of various crops.
- Horticulture.
- Input in agriculture.
- Irrigation pattern.
- Livestock.
- Sericulture.
- Fisheries.

The investigator has made an attempt to understand the physical, socio-economic and environmental conditions, level of infrastructure facilities, which exists in the system, at the grassroots level. To realize the real functions of the study area at the grassroots level, survey research techniques have been employed to conduct the investigation.

The investigator herself has conducted the detailed survey by using the pre-tested schedules in 100 households at the grassroots level to understand the functions of the system. All the schedules were thoroughly examined for consistency followed by data vetting and were chosen for data analysis. Subsequently, the data were transferred into code sheets, and thereafter into computer to avoid errors and used EXCEL software for statistical analysis.

To analyze the data, household income has been considered as the dependent variable, and the remaining major variables are considered as independent variables.

DYNAMIC FEATURES OF THE STUDY AREA

		General	%	OBC	%	SC	%	ST	%	No.	%
1	0-10000	13	36	6	24	6	24	3	21	28	28
2	10000-20000	7	19	13	52	13	52	9	64	42	42
3	20000-30000	4	11	2	8	2	8	0	0	8	8
4	30000-40000	3	8	1	4	3	12	1	7	8	8
5	>40000	9	25	3	12	1	4	1	7	14	14
	TOTAL	36	100	25	100	25	100	14	100	100	100

Source: Primary Household Survey- 2011.

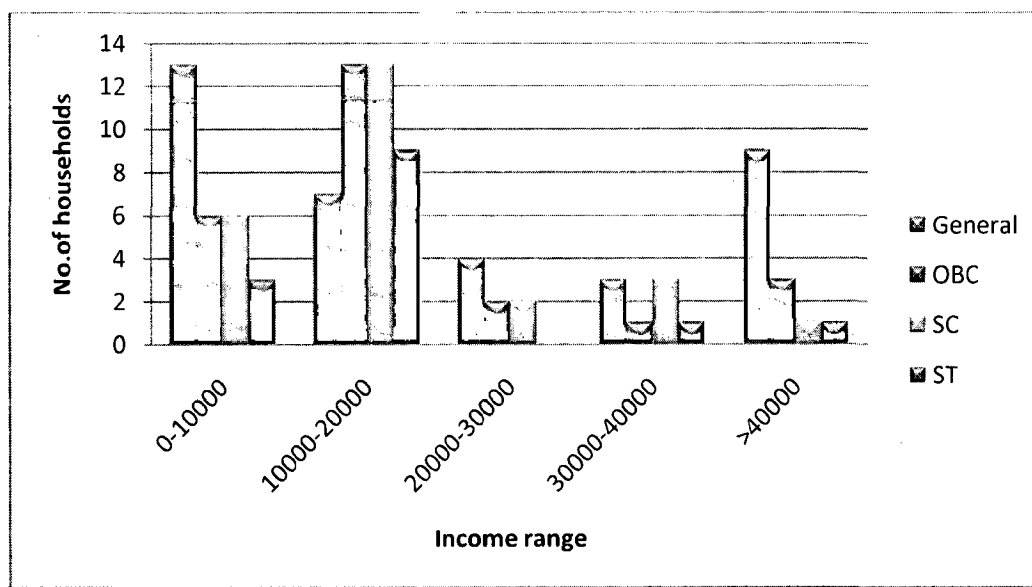


Figure 5.02: Caste distribution with Income

This table shows that more than one third (36 per cent) of the total households are general, one fourth (25 per cent) are OBC and SC respectively and a little more than one tenth (14 per cent) come in the ST category. All the four castes are predominantly available in the first income category of 0-10,000 and their percentage distribution is comparable. It has been observed that the general category are evenly distributed in all the five income categories i.e., (36 per cent) for 0-10,000, less than one fifth (19 per cent) for 10,000-20,000, (11 per cent) for 20,000-30,000, less than one-tenth (8 per cent) for 30,000-40,000 and one fourth (25 per cent) for the last income category. The castes OBC, SC and ST are more in the first two income categories and they contribute to almost three fourth (75 per cent) when combined. The second income range of 10,000-20,000 seems to have household distribution of more than half (52 per cent, OBC), (52 per cent SC) and (64 per cent ST) respectively of the total households surveyed. When the total structure of the community on the basis of caste distribution is taken into account, a less than one third (28 per cent) of the households come in the income range of 0-10,000. Less than half (42 per cent) of the households are majorly in the second

range of 10,000-20,000 and only 8 per cent lies in the third and fourth income group. Lastly, more than one tenth (14 per cent) of the households earn above 40,000 rupees monthly. The OBC, SC and ST categories are more dominant in the north-eastern regions and are engaged in primary sector. This can be well deduced from the percentage distribution of households in the second and third group. These communities are also engaged in agriculture and its allied activities like sericulture, horticulture, fisheries, animal husbandry etc. It has been observed that the available General category households are almost evenly distributed in all segments of income groups, and the General category households are more as compared to other castes. This table concludes that the city is much dominated by the households belonging to the General community.

5.4 SETTLEMENT PATTERN: The investigator has taken the settlement pattern parameter as one of the important aspect to understand the sample district scenario. Out of the 100 households, 30 per cent household survey has been done in the urban areas/city/town and rest 70 per cent households were chosen from the rural areas. This was done to actualize and understand all the three sectors of the society i.e., primary, secondary and tertiary. Urban and rural sector when combined, two seventh (28 per cent) of the households are in the income category of 0-10,000, two fifth (40 per cent) of the households lie in 10,000-20,000 range, one tenth (10 per cent) are in 20,000-30,000 slab, a little less than one tenth (10 per cent) is in 30,000-40,000 range and one seventh (14 per cent) of the total households earn above 40,000 rupees monthly. Now when the urban sector is reviewed individually, not a single household could be found within the first two income categories. More than one fourth (27 per cent) households fall in the third and fourth income category whereas a little less than half (47 per cent) is dominant in the last slab. It can be concluded from this table that in the urban setup, most of the household are in secondary and tertiary activities. A total reverse scenario can be observed in the rural sector. Two fifth (40 per cent) and more than half (57 per cent) households are in the first and second income slabs respectively. Just 3 per cent households fall in the 20,000-30,000 category and that too those households who are engaged in more than one occupational sector.

Table 5.03: Settlement Pattern with Income

Table No.3 - Settlement Pattern(V)

DYNAMIC FEATURES OF THE STUDY AREA

1	2	3				4	
S.No.	Income	Settlement Pattern				Total	
		URBAN	%	RURAL	%	No.	%
1	0-10000	0	0	28	40	28	28
2	10000-20000	0	0	40	57	40	40
3	20000-30000	8	27	2	3	10	10
4	30000-40000	8	27	0	0	8	8
5	>40000	14	47	0	0	14	14
	TOTAL	30	100	70	100	100	100

Source: Primary Household Survey- 2011.

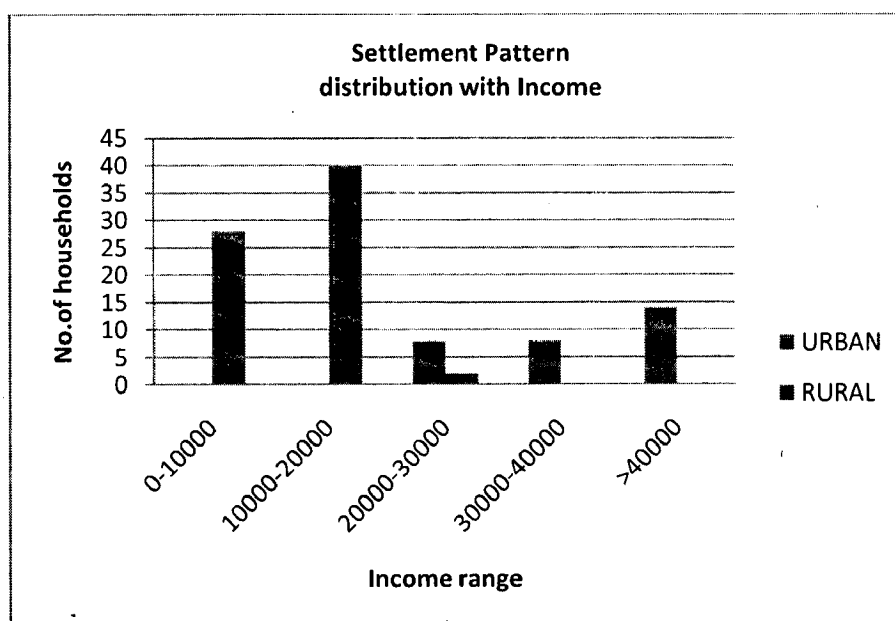


Figure 5.03: Settlement pattern distribution with Income Range

5.5 AGE GROUP:

Table 5.04: Age group distribution with Income Range

Table No.4 - Age Group (V2)													
1	2	3										4	
S.No.	Income	Age - Group										Total	
		0-15	%	15-30	%	30-45	%	45-60	%	60+	%	No.	%
1	0-10000	34	29	55	27	46	30	15	16	11	22	161	26
2	10000-20000	71	61	111	54	74	49	36	38	19	37	311	50
3	20000-30000	4	3	13	6	5	3	13	14	2	4	37	6
4	30000-40000	7	6	6	3	12	8	8	9	4	8	37	6
5	>40000	1	1	22	11	14	9	22	23	15	29	74	12
	TOTAL	117	100	207	100	151	100	94	100	51	100	620	100
	PERCENTAGE	19		33		24		15		8		92	

Source: Primary Household Survey- 2011.

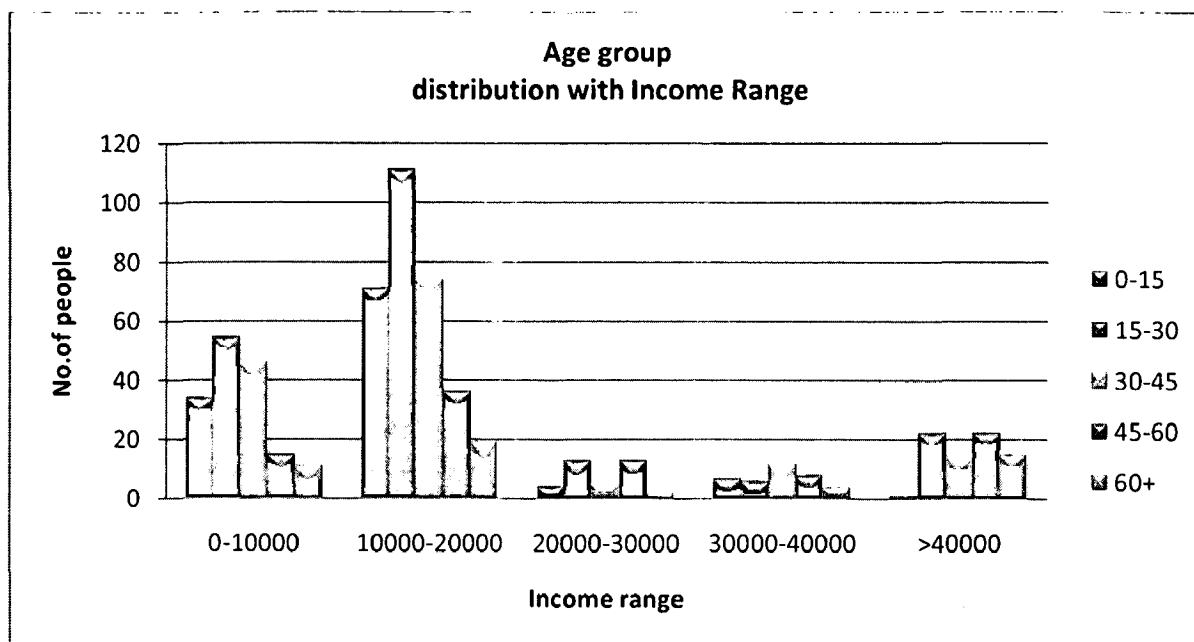


Figure 5.04: Age group distribution with Income Range

5.6 MARITAL STATUS: Marriage is one of the most important institutions of the society and can be taken as a parameter of study. It can be observed from the table that almost three fifth (58 per cent) of the total population is married and rest two fifth (42 per cent) is unmarried. One fourth (25 per cent) of the married population comes in the first income category and about half (49 per cent) is in the second category. A minor 5 percent and 7 per cent married population lies in the third and fourth group respectively, whereas, more than one tenth (14 per cent) are above 40,000 slab. More than half (51 per cent) unmarried population earn in the range of 10,000-20,000 and two seventh (28 per cent) come under 0-10,000 income range. It can be concluded from the table that both married and unmarried population show uniformity in the income ranges.

Table 5.05: Marital Status distribution with Income Range

1	2	3				4	
S.No.	Income	Marital Status				Total	
		Married	%	Unmarried	%	No.	%
1	0-10000	89	25	72	28	161	26
2	10000-20000	175	49	132	51	307	50
3	20000-30000	19	5	18	7	37	6
4	30000-40000	24	7	13	5	37	6
5	>40000	51	14	23	9	74	12
	TOTAL	358	100	258	100	616	100
	PERCENTAGE	58		42		100	

Source: Primary Household Survey- 2011.

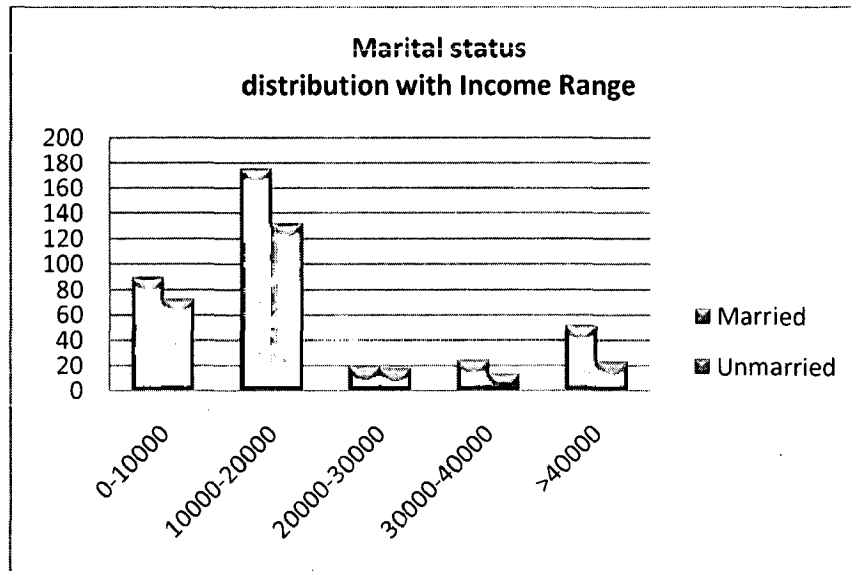


Figure 5.05: Marital status distribution with Income Range

5.7 LITERACY AND EDUCATION: Literacy and Education are the two eyes of socio-economic development of any system. The study area has 63.98 per cent of literacy rate as per Census of India, 2001. To understand the status of education among the households, the qualified persons are classified into the following category; they are Up to metric, High school, Graduation, Post graduation, Technical education and Illiterate.

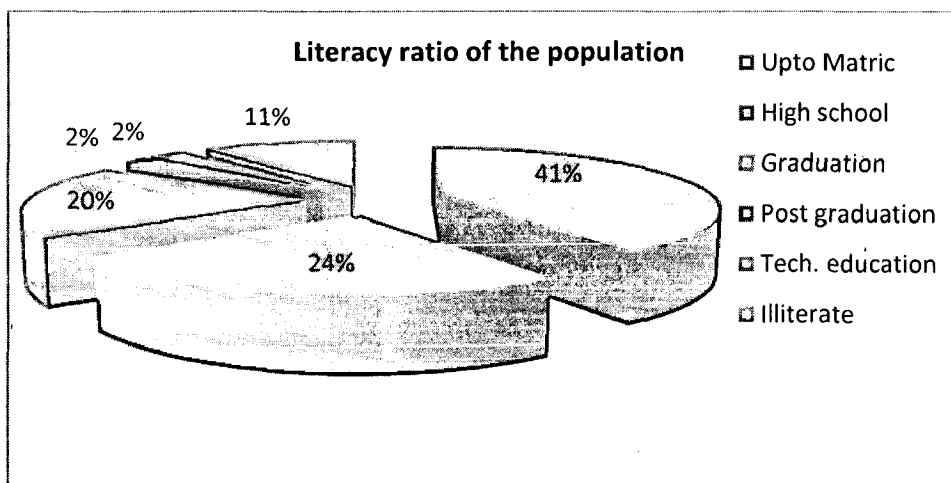


Figure 5.06: Literacy ratio of the population

As can be seen from the above pie chart, two fifth (41 per cent) of the population has qualification up to matric, a little less than one fourth (24 per cent) have education up till high school and one fifth (20 per cent) population are graduate.

Table 5.06: Level of Education with Income Range

Table No.6 - Education (V4)			
1	2	3	4

DYNAMIC FEATURES OF THE STUDY AREA

S.No.	Income	Education												Total	
		Upto Matric	%	High school	%	Graduation	%	Post graduation	%	Tech. education	%	Illiterate	%	No	%
1	0-10000	88	35	33	22	5	4	1	10	0	0	30	44	157	25
2	10000-20000	135	54	82	54	55	45	5	50	4	25	33	49	314	51
3	20000-30000	11	4	8	5	14	11	0	0	3	19	1	1	37	6
4	30000-40000	13	5	14	9	10	8	0	0	0	0	0	0	37	6
5	>40000	5	2	15	10	38	31	4	40	9	56	4	6	75	12
	TOTAL	252	100	152	100	122	100	10	100	16	100	68	100	620	100
	PERCENTAGE	41		25		20		2		3		11		100	

Source: Primary Household Survey- 2011.

Only 4 per cent of the surveyed population is post graduate and has technical education, remaining more than one tenth (11 per cent) population is illiterate. This shows that more two third (66 per cent) of the population has the advantage of basic and primary education.

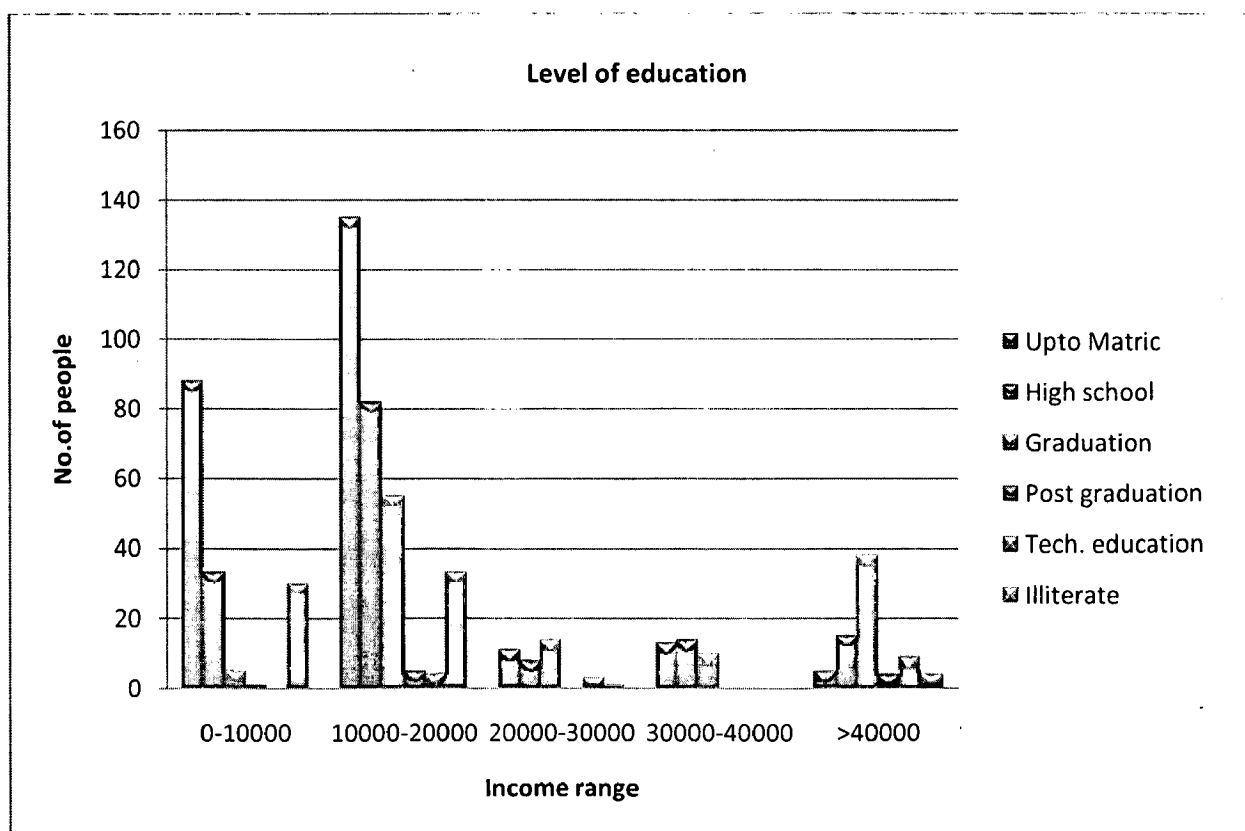


Figure 5.07: Level of education with Income Range

In the population with education till matric, more than one third (35 per cent) are in the income slab of 0-10,000, a slight more than half (54 per cent) lie in the second group, a

tiny population of 4 per cent and 5 per cent are in the third and fourth income group and finally only 2 per cent population are in the last income slab. The number of people in the income range 10,000-20,000 and above 40,000 is graduate and post graduate i.e., almost half (45 per cent) - (50 per cent) and one third (31 per cent) – (40 per cent) respectively. This is quite evident that with the increasing purchasing power, knowledge and awareness, the level of education would rise in any given system. Illiteracy is prevalent in the first two income category (44 per cent) and almost half (49 per cent) respectively but with the increasing monthly income illiteracy diminishes. The percentage of illiteracy is negligible or absent in the third and fourth income slabs. It clearly indicates that households have higher income with higher qualification on one hand, and the middle income group also has equal contribution on the other hand. Therefore one can easily conclude that higher income work as a catalyst for higher education in the system.

5.8 EMPLOYMENT AND OCCUPATION: Employment is considered as one of the most important parameters and considered as the 'back bone' of the economy in the system. The employment opportunities in the primary, secondary, and tertiary sectors of the economy have been considered in this investigation. The ratio of unemployed population in the system is more than half (57 per cent). The next major share of people are engaged in the primary sector, i.e., agriculture which is a little less than one fifth (18 per cent) of the total population. The secondary and tertiary occupational sector like business, self employment, private jobs and government jobs have very less percentage population. This shows that almost half of the total study area is unemployed. Under this group come children, housewives and elderly people. This can also be implied that in a household the no. of earning members are very less as compared to the dependant members.

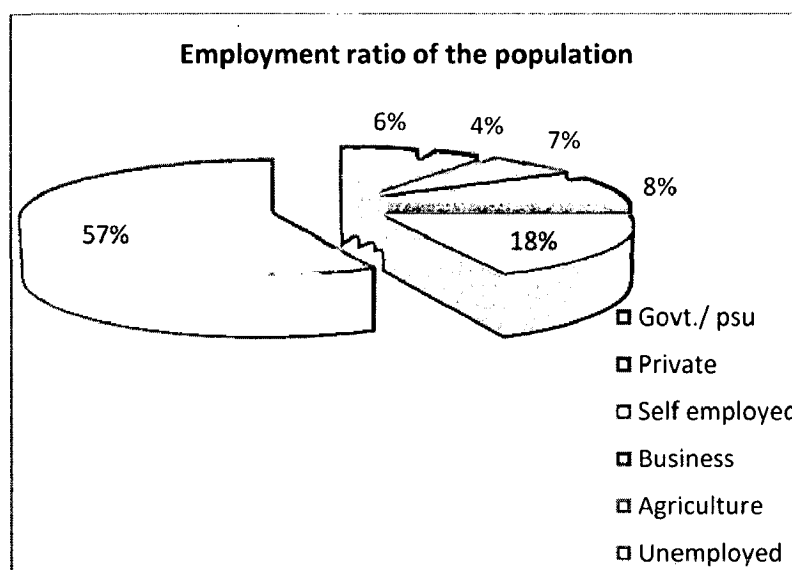


Figure 5.08: Occupational ratio of the population

Table 5.07: Occupational structure with Income Range

1 S.No.	2 Income	3 Occupation												4 Total	
		Govt./psu	%	Private	%	Self employed	%	Business	%	Agriculture	%	Unemployed	%	No.	%
1	0-10000	5	13	9	41	16	36	8	16	12	11	108	31	158	25
2	10000-20000	17	45	3	14	17	39	17	33	87	77	162	46	303	49
3	20000-	4	11	0	0	4	9	5	10	12	11	17	5	42	7

DYNAMIC FEATURES OF THE STUDY AREA

	30000														
4	30000-40000	2	5	1	5	2	5	9	18	2	2	27	8	43	7
5	>40000	10	26	9	41	5	11	12	24	0	0	38	11	74	12
	TOTAL	38	100	22	100	44	100	51	100	113	100	352	100	620	100
	PERCENTAGE	6		4		7		8		18		57		100	

Source: Primary Household Survey- 2011.

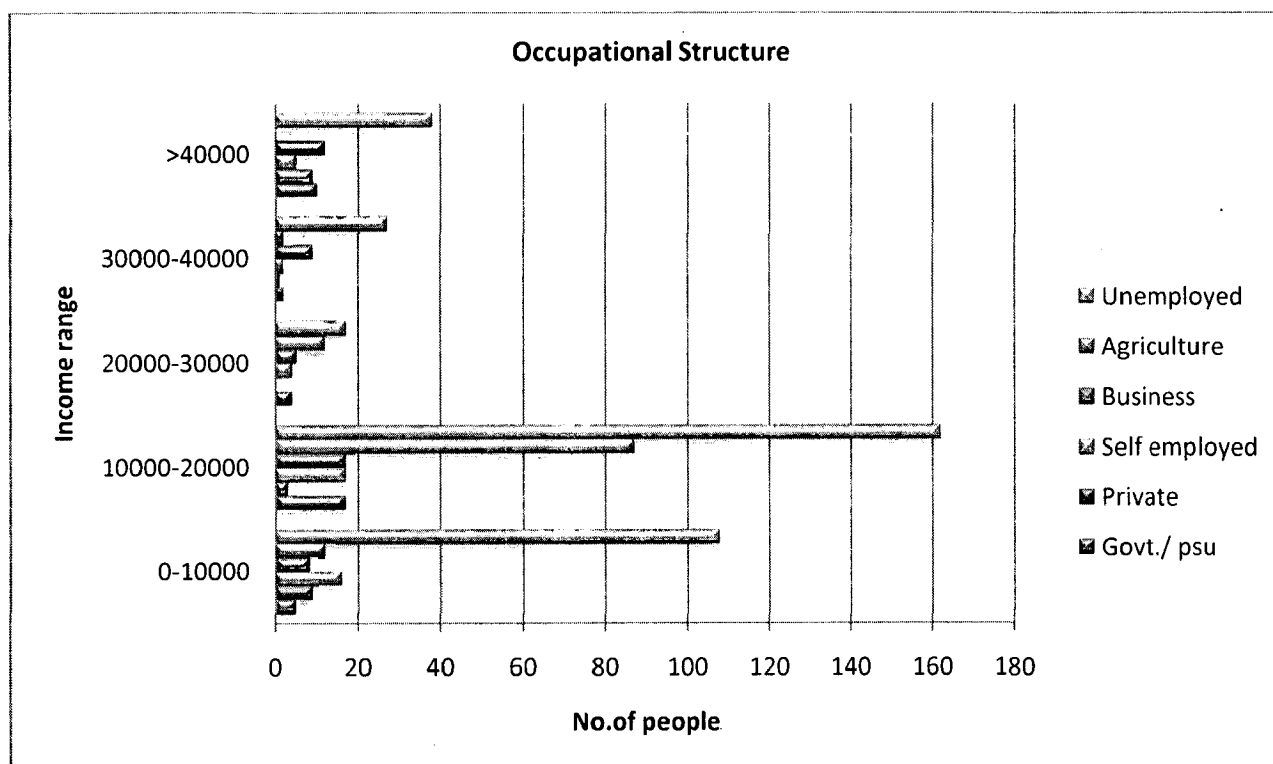


Figure 5.09: Occupational structure with Income Range

As can be observed from the table, very less population is in the income range of 20,000 – 40,000. This gives us a fair idea that people in this range are engaged in single occupation sector. In this system, secondary sector plays a significant role. Here, more than two fifth (41 per cent) and one seventh (14 per cent) population come in the income group 0-10,000 and 10,000-20,000 respectively have private jobs. This shows that in a household there are members who are in the primary as well as secondary sector.

Tinsukia district is the commercial hub of Assam and centre of business and trade to the neighbouring states. Therefore, commercial activities are very vibrant in the system. As can be observed from the above table, the income range is uniformly distributed for the population engaged in business and secondary activities. A bit less than one fifth (16

per cent) of the total population in business come in the first income slab. One third (33 per cent) earn 10,000-20,000 rupees, also only one tenth (10 per cent) are in the third income range. With the increasing purchasing power, an increase in the no. of people in business increases which triggers the dynamic wheel of economy.

In the primary sector, agriculture, there are very less people in 30,000-40,000 slab and diminishes on reaching the last slab i.e., above 40,000. There are more than one tenth (11 per cent) population in the first slab and more than two third (77 per cent) population are in the second income group of 10,000-20,000 which means that this group is involved in agriculture as well its allied activities like horticulture, sericulture, animal husbandry etc. With increasing education, income and knowledge people tend to earn more with optimization of resources.

5.9 HOUSEHOLD EXPENDITURE: The Investigator studied the expenditure pattern of the surveyed households in terms of actual monthly expenditure for each income category. Income and expenditure are having direct relation, and income decides the purchasing power of the people in a particular system. Normally, the higher income group people spend more amount of money than the lower income group people, since the higher income groups have strong purchasing power. The lower income group normally spends more amounts of money towards their food for their survival. The higher income group generally spends more money to take pleasure in the infrastructure facilities, whereas it almost absence in case of the lower income group, since they have only very little capacity of purchasing power. Expenditure among various income groups towards other kinds of expenses, which include power consumption, cooking gas, petrol/diesel, health, cloths, education, recreation, transport, telephone and other expenses are varying depending upon their level of income. Having the above in mind, the Investigator made an attempt to analyze the expenditure pattern of different income categories, pertaining to some major selected activities, and the results are presented as below:

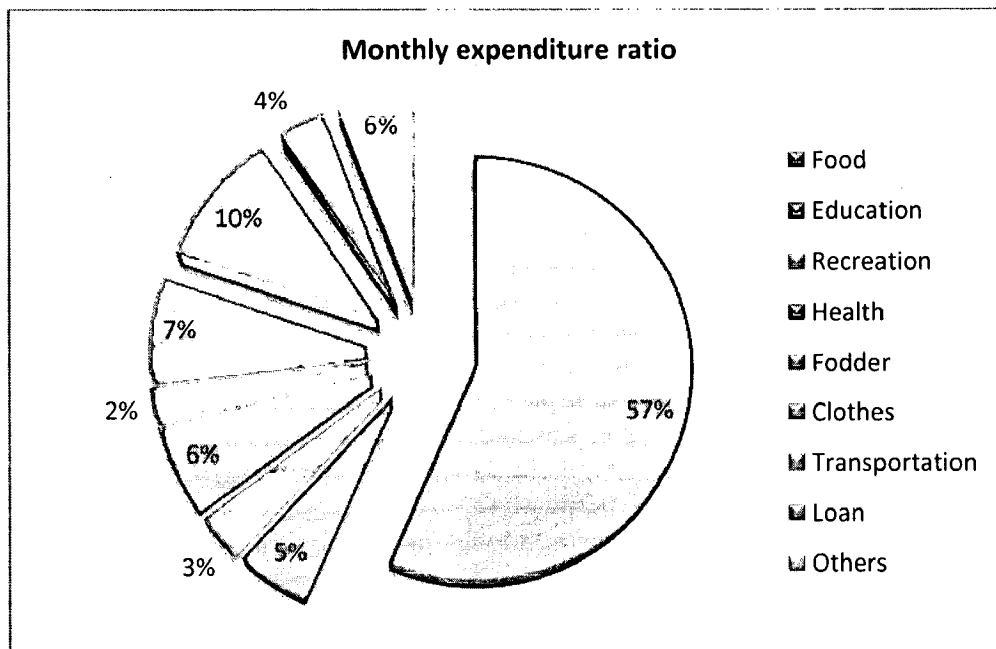


Figure 5.10: Monthly expenditure ratio of the study area

In the given system, more than half (57 per cent) of the population spend more on food. In the rural setup, in many households 90 per cent expenditure is on food. Further, it can be deduced from the above pie chart that the next major share in the spend list is on transportation. One tenth (10 per cent) of the population spend on it as the provision of public transport is not up to the mark in the given system. Lack of physical infrastructure and also poor provision of public and rural transport are reason why people spend on this amenity. Nearly less than one tenth (7 per cent) spend on clothing, (6 per cent) spend on health facilities, (5 per cent) on education and (6 per cent) on other amenities. In this system, availability of government schools and institutions has helped the masses and due to which the expenditure on education is less. A very tiny 3 per cent population spend on community or recreational facilities. This is due to the fact that the required amount of physical and social infrastructure is not available. Only 2 per cent of the total surveyed population spend on fodder for their livestock. In most of the cases, people graze their livestock in their fields and less awareness has held back this system to adopt White Revolution measures to increase the livestock output. In the urban system, many households have taken loans which are nearly 4 per cent of the total population which implies that the economy is not developed.

The following Table and Figure shows that there are two income groups, 0-10,000 and 10,000-20,000 who spend a little less than half (44 per cent) monthly. Less than one tenth (8

per cent) in the third income group 20,000-30,000 spend monthly and only 2 per cent households are in the fourth and last group.

Table 5.08: Expenditure with Income Range

Table No.8 - Expenditure (V8)			
1	2		
S.No.	Expenditure		
	Income	Households	%
1	0-10000	44	44
2	10000-20000	44	44
3	20000-30000	8	8
4	30000-40000	2	2
5	>40000	2	2
	TOTAL	100	100

Source: Primary Household Survey- 2011.

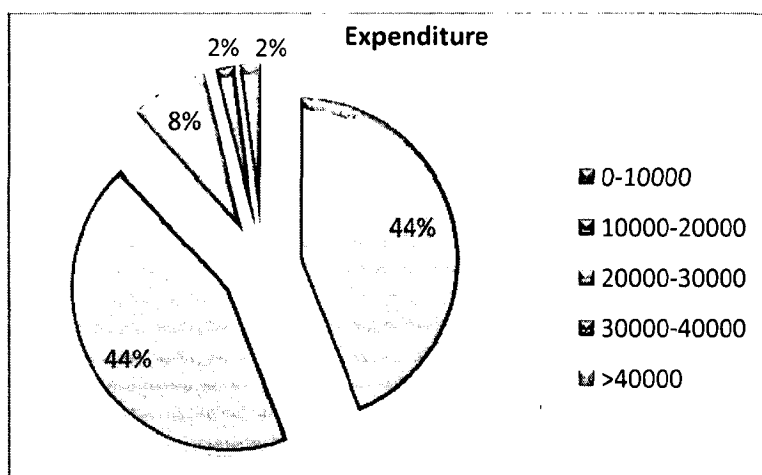


Figure 5.11: Monthly expenditure distribution with income range

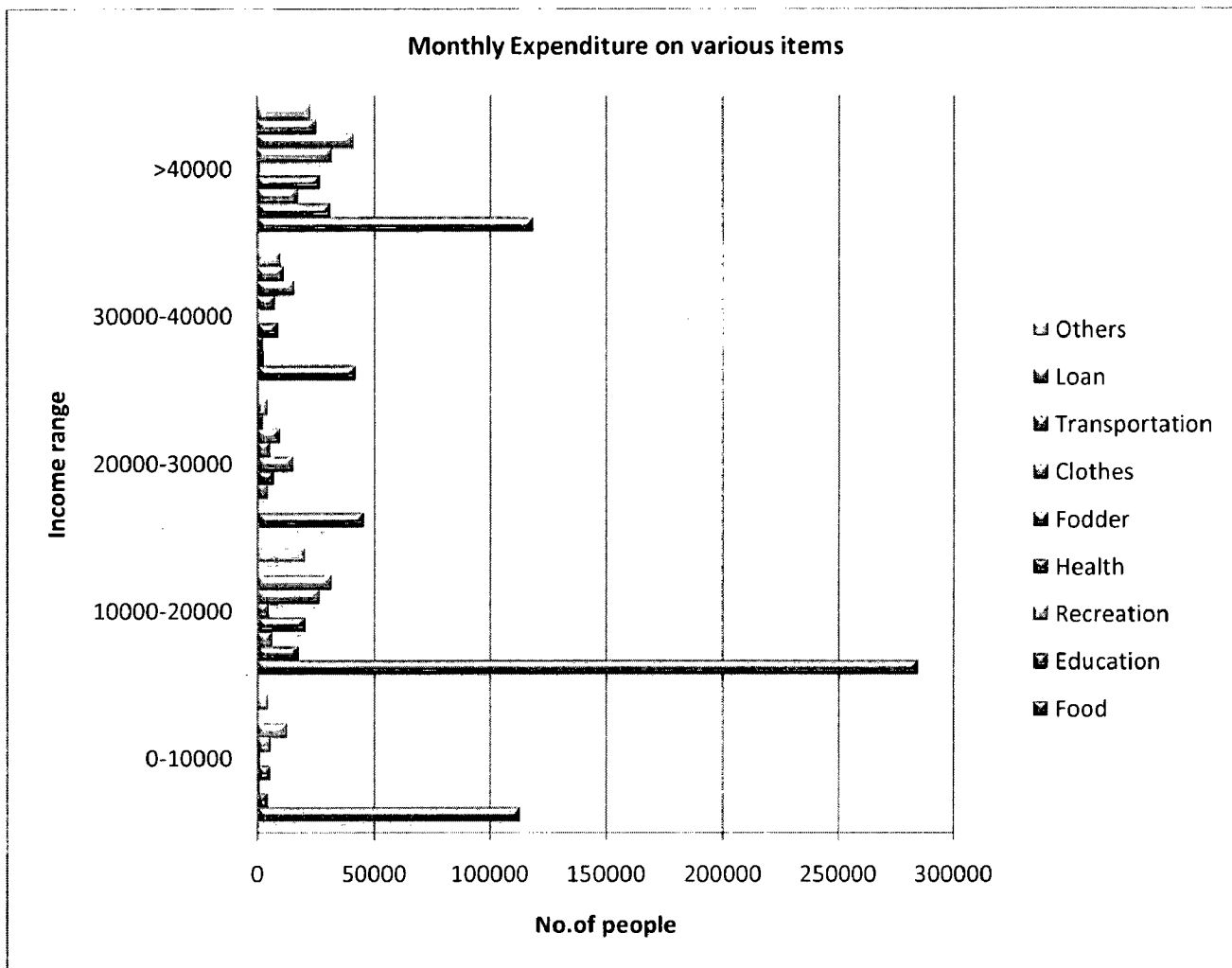


Figure no. 5.12: Monthly expenditure distribution with income range

5.9.1 EXPENDITURE ON FOOD: Food is considered as one of the basic necessities of life for survival. A substantial share of household income is spent to cater this basic necessity of life. The investigator studied the expenditure pattern of the surveyed households in terms of actual monthly expenditure, as percentage of monthly income, for each income category and can be seen from the Table and Figure above. This explains that food expenditure is increasing along with increase in income for the first two income groups which are having monthly income up to Rs.20,000, and then observed the reverse trend for the next two income groups up to Rs. 40,000 but increase in the last income group of above 40,000 rupees which can be a reason that with the increase in monthly income, the food consumption pattern differs. Rather than just having staple food people tend to invest more on fancy and costly food items, dining outdoors also come into picture. Further, it has been observed from the table that almost half (47 per cent) of the total number of surveyed households spend

their monthly income on food and are in the income category on 10,000-20,000. About one-fifth (19 per cent) are in the first category in spending their monthly income on food. The table also reveals that while in the highest income category, all households spend less than one-fifth (20 per cent) of their monthly income on food. The middle two income category of 20,000-30,000 and 30,000-40,000 spend less than one tenth (8 per cent) and (7 per cent) respectively on food but these two groups also spend on other amenities. Whereas the lower income group spend massively on food which reveals that this category does not have any life.

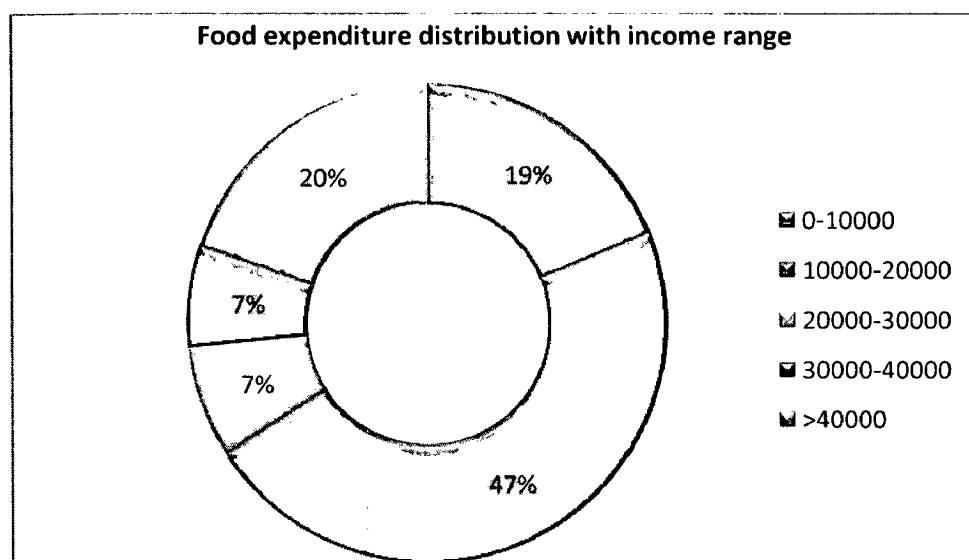


Figure 5.13: Food expenditure distribution with income range

5.9.2 EXPENDITURE ON EDUCATION: Education is one of the important parameters for the socio-economic development of any system. The share of expenditure towards the education indicates awareness in the society. Further, education decides the income earning opportunity of the households in the system. Having the above knowledge in mind, the investigator studied the expenditure for education. The expenditure pattern of the surveyed households is studied in terms of actual monthly expenditure, as percentage of monthly income, for each income category and the results are presented below. This explains that expenditure on education is increasing along with increase in income for first two income groups are having monthly income up to Rs.20,000 and then observed the reverse trend. Further, it illustrates that income group 20,000-30,000 do not spend on education. This may be possible because the population in this group is already less and the student crowd is not present in this group. Less than one tenth (8 per cent) of the total spend on education in the first

income bar, nearly one third (31 per cent) are present in the second group and more than half (56 per cent) of the total surveyed population spend on education which implies that with rising income, awareness for education comes in and educated people tend to earn more in the system.

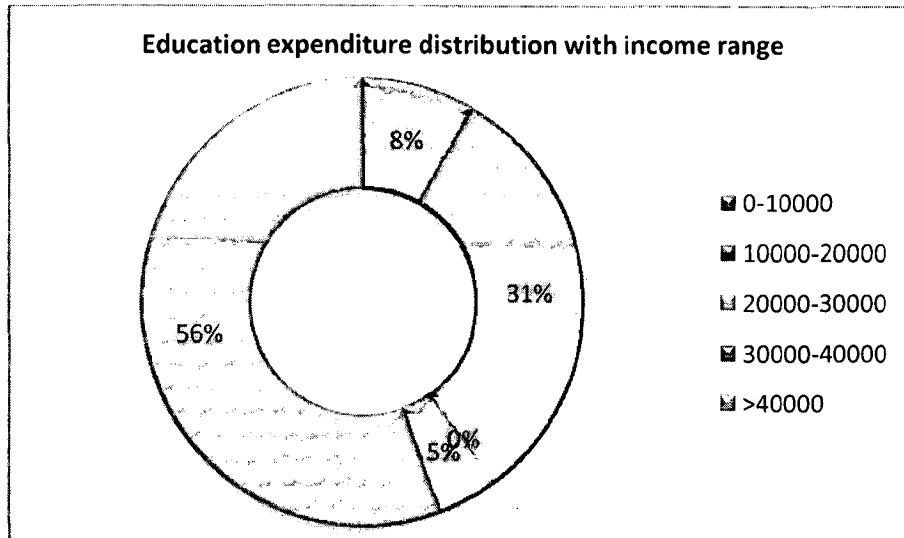


Figure 5.14: Education expenditure distribution with income range

5.9.3 EXPENDITURE ON RECREATION: Recreation is one of the important parameters of study as it shows the reflection of quality of life amongst the masses of the study area. With the increasing income, an increase in spending on recreation activities can be observed that the first two income slabs but the trend reverses for the next two groups till households earning 40,000 rupees monthly. In this system, the investigator has identified that less than one tenth (8 per cent) of the population come in the group 0-10,000, one fifth (20 per cent) come in group of 10,000-20,000, more than one tenth (14 per cent) are in the third range, a feeble 7 per cent spend on recreation in fourth group and lastly, more than half (55 per cent) of the final group above 40,000 can afford recreational and community facilities. This is also due to the fact that such infrastructure is mostly available in the urban setup and commutation problems pose a hurdle for the other groups.

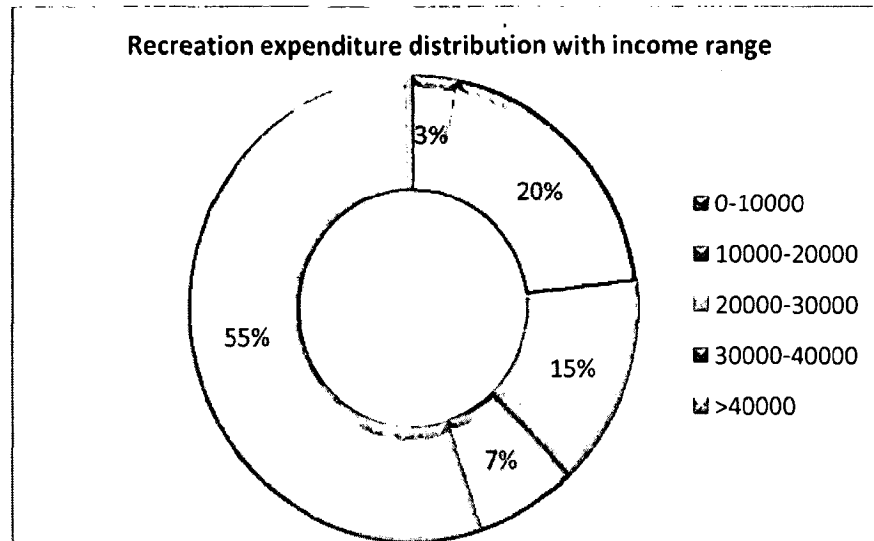


Figure 5.15: Education expenditure distribution with income range

9.4 EXPENDITURE ON HEALTH: Health is another one of the most important needs of human being in the system. Expenditure on health indicates awareness of people about health in the system, and the quality of life prevailing in the system. It also points towards availability of health care facilities in the system and people’s paying ability on health facilities. The investigator realized the importance of the health facilities and its expenditure, are studied the data carefully. In this system, expenditure on health facilities are mostly uniform in all the income ranges and with increasing income expenditure also increases. Almost about one tenth (8 per cent) population are in the first slab, less than one third (30 per cent) are in second bar, one tenth (10 per cent) are in third group, more than one tenth (13 per cent) are in fourth group and almost about two fifth (39 per cent) spend on health facilities. This also explains the fact the availability of healthcare institutions like PHCs, sub-centres, hospitals etc. are within the accessible range of the surveyed households.

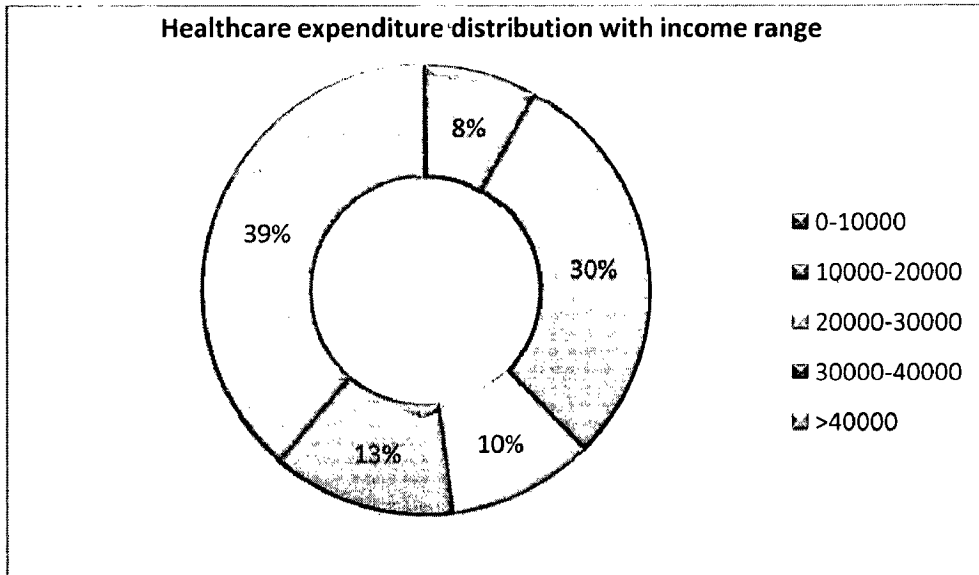


Figure 5.16: Healthcare expenditure distribution with income range

5.9.5 EXPENDITURE ON FODDER: Fodder is also a parameter of study because in this system, there are many households which are engaged in animal husbandry, sericulture, fisheries etc. but do not own agrarian land where they can graze their animals and use the farm by-product as input to their livestock. They have to spend exclusively on fodder which makes it an important component of study. The first three income groups are engaged in agricultural allied activities, therefore, their expenditure range also increases with the increasing income. In the income range 0-10,000 only 3 per cent household spend on fodder, almost one fourth (23 per cent) are in second range and around two third (69 per cent) are of the income range 20,000-30,000. A very meagre 4 per cent spend on fodder being at the last income range.

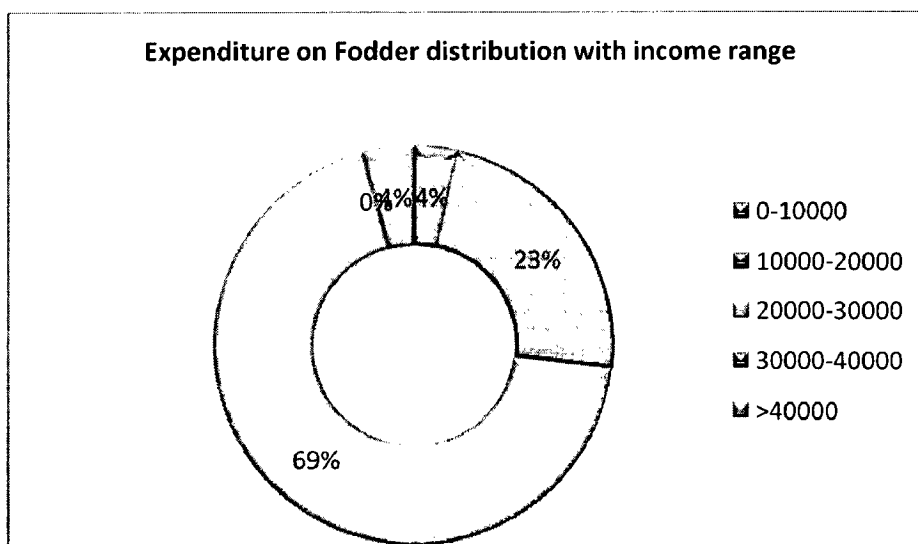


Figure 5.17: Fodder expenditure distribution with income range

.6 EXPENDITURE ON CLOTHES: Clothing is one of the basic needs of community in life. This Figure below reveals that the expenditure on cloths is increasing along with increase in income for first two income groups are having monthly income up to Rs.20,000 and then observed the reverse trend in the system. Further, it has been observed that almost one third (34 per cent) of the total number of surveyed households spend between on clothes and earn in the 10,000-20,000 range. There is an increase in the expenditure pattern on clothes as the income rises because people in the higher income category tend to spend more on clothing. The households with low monthly income generally either do not spend or buy inexpensive clothing for themselves.

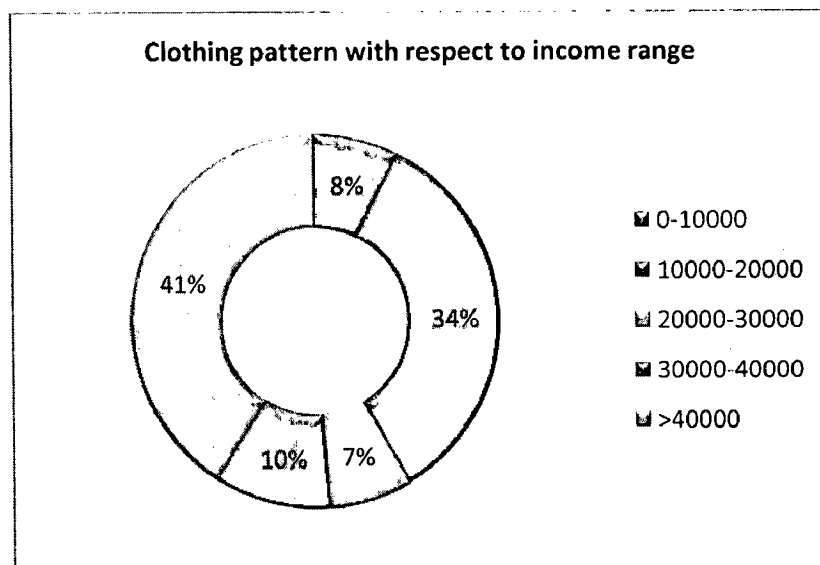


Figure 5.18: Clothes expenditure distribution with income range

5.9.7 EXPENDITURE ON TRANSPORTATION: The transportation is one of the important parameters, which decides the functions of the systems. An efficient transportation system leads to more dynamic functions of a particular system. A transportation activity in the system shows the extent of mobility prevails in the system and dependence of people on the transportation activities for various purposes. Expenditure for transportation indicates the economic status of the people in the system and it is directly or indirectly related with quality of transportation available in the system. Having this knowledge, the Investigator studied the expenditure for transportation. The expenditure pattern of the surveyed households is studied in terms of actual monthly expenditure, and as percentage of monthly income, for each income category, and the results are presented below.

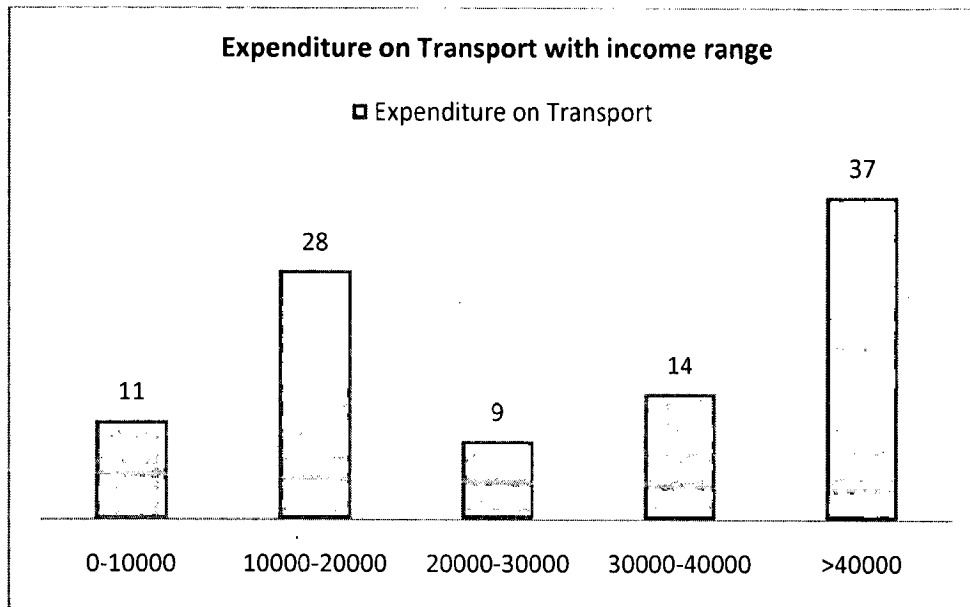


Figure 5.19: Expenditure on Transport with income range

In the surveyed households, more than one tenth (11 per cent) spending on transport is in the first income range. This shows that due to the poor physical infrastructure and unavailability of rural transport people tend to spend more on transportation. The expenditure on transportation increases from the first to the second income range then drops in the third group and again rises till the last income range above 40,000. People in the fourth and fifth group are wealthy and can afford personal vehicles which justify the spending pattern above the ladder. About one third (28 per cent) spending on transport are in the second group, almost one tenth (9 per cent) and (14 per cent) are in income range three and four. People in all the income groups do a lot of travelling by walk and cycling which is one of the reasons of low public transportation and less spending on transport.

5.9.8 EXPENDITURE ON LOAN: The investigator has found out a very interesting situation in the surveyed area. In this system, with the increase in monthly income the households paying instalments to some loan took also increases. In the first three groups, where majority households are engaged in agriculture and its allied activities, the loan percentage is near meagre. Whereas, households involved in the secondary and tertiary sector are credited with loan which they pay off monthly in the form of EMIs. There are about one third (29 per cent) in fourth group and two third (65 per cent) in the last group.

This implies that loan is taken to expand the business, commercial activities etc. which in return earns profits and savings which can be again put for developmental purposes of oneself. This phenomenon results in the Dynamic Wheel of Economy.

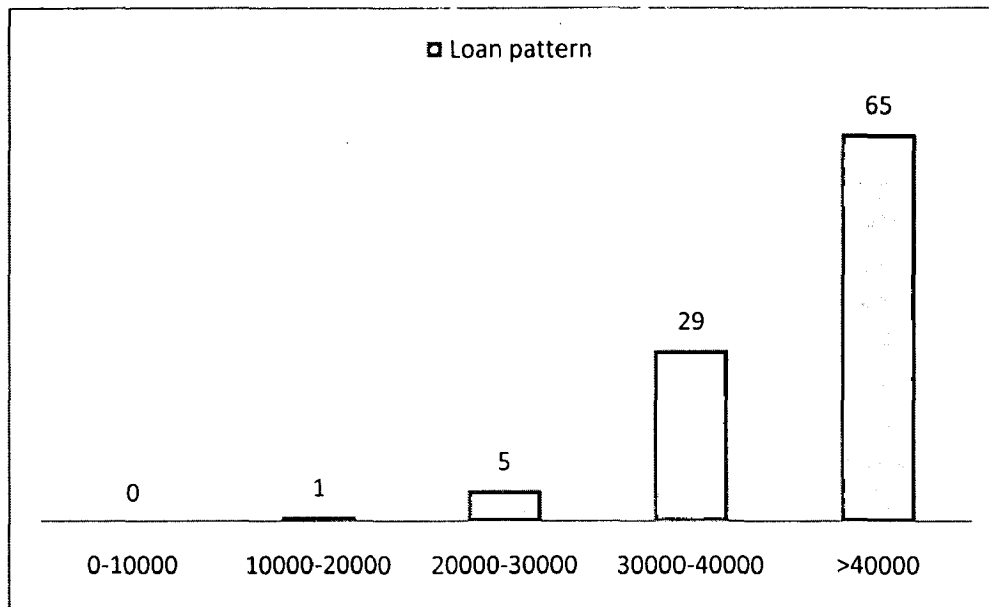


Figure 5.20: Expenditure on paying EMIs of Loan taken with income range

5.9.9 EXPENDITURE ON OTHERS: Less than one tenth (8 per cent) of the households of 0-10,000 income range spend on other expenses monthly. One third (33 per cent) are in the second group, minute 7 per cent are in third income range, less than one fifth (16 per cent) fall in fourth group and lastly about remaining one third (37 per cent) lie in the category above 40,000. In this category, expenditure on telephone and mobile also plays an important role. Almost all the households are observed to spend on mobile phones but only households with high income have landline connection and pay monthly landline rental and bill. The expenditure on internet increases with the increasing income level.

5.10 HOUSEHOLD EXPENDITURE ON ENERGY: Energy plays a vital role in economic development of the system. Energy consumption is the most important parameter, which decides the functions of the system. A country's or city's economic strength can be assessed based on the quantity of energy consumption, sources of energy consumption, types of energy consumption, energy conservation, technology adoption in energy consumption, demand and supply of energy, etc., Having this knowledge, the Investigator studied the expenditure pattern of energy in terms of expenditure towards the consumption of petrol, diesel, LPG, kerosene, electricity, fuel wood, charcoal, biogas

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and Pipeline LPG. The expenditure pattern of the surveyed households is studied in terms of actual monthly expenditure, as percentage of monthly income, for each income category, and the results are presented in sequel.

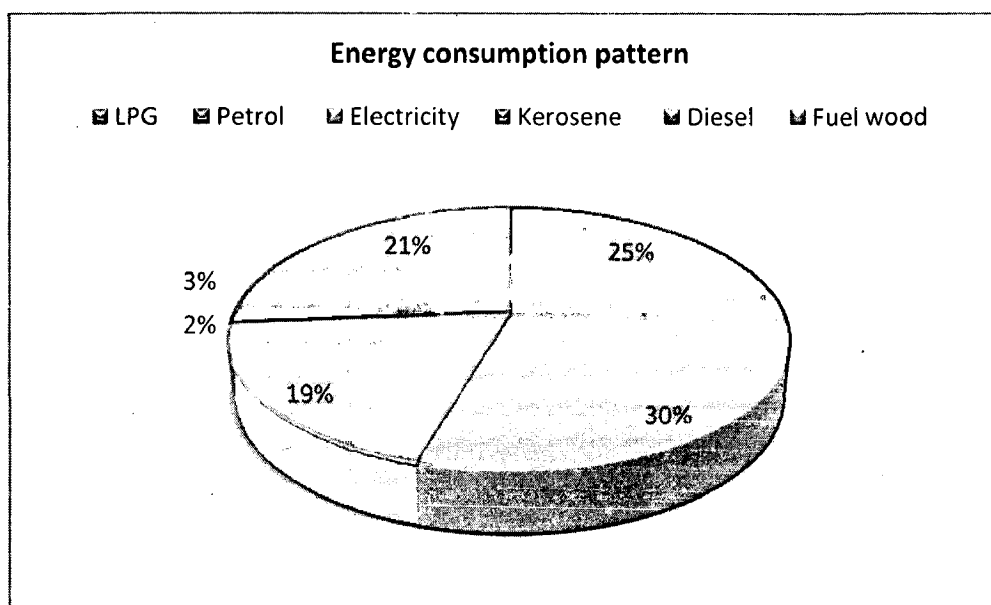


Figure 5.21: Energy consumption pattern of the study area

The above figure shows that in the given system, the expenditure on energy is versatile and varied. There is uniformity in the various type of energy consumption. About one third (30 per cent) households use petrol, one fourth (25 per cent) spend on LPG, a little less than one fifth (19 per cent) spend on electricity. The low electricity consumption can be attributed to fact that the electricity supply is not sufficient and suffers power cuts which unable its prolonged use. More than one fifth (21 per cent) households use fuel wood as their source of cooking. The percentage use of kerosene is as low as 2 per cent as its supply is rationed. In this system, diesel drawn energy is less. There are some farmers who possess tractors and require diesel to plough their fields.

Table 5.09: Energy Expenditure with Income Range

1	2	3												4	
S.N o.	Income	Energy Consumption (in Rs.)												Total	
		LPG	%	Petr ol	%	Electri city	%	Keros ene	%	Die sel	%	Fue l wo od	%	No.	%
1	0-10000	6650	17	600	1	6150	20	1100	30	0	0	12600	37	27100	17
2	10000-20000	19260	48	18300	38	10850	35	1910	53	2400	46	20000	59	72720	45

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3	20000-30000	3890	10	6480	13	3050	10	250	7	0	0	1200	4	14870	9
4	30000-40000	4260	11	2400	5	2900	9	165	5	1200	23	0	0	10925	7
5	>40000	5680	14	20700	43	7950	26	195	5	1600	31	0	0	36125	22
	TOTAL	39740	100	48480	100	30900	100	3620	100	5200	100	33800	100	161740	100
	PERCENTAGE	25		30		19		2		3		21		100	

Source: Primary Household survey, 2011.

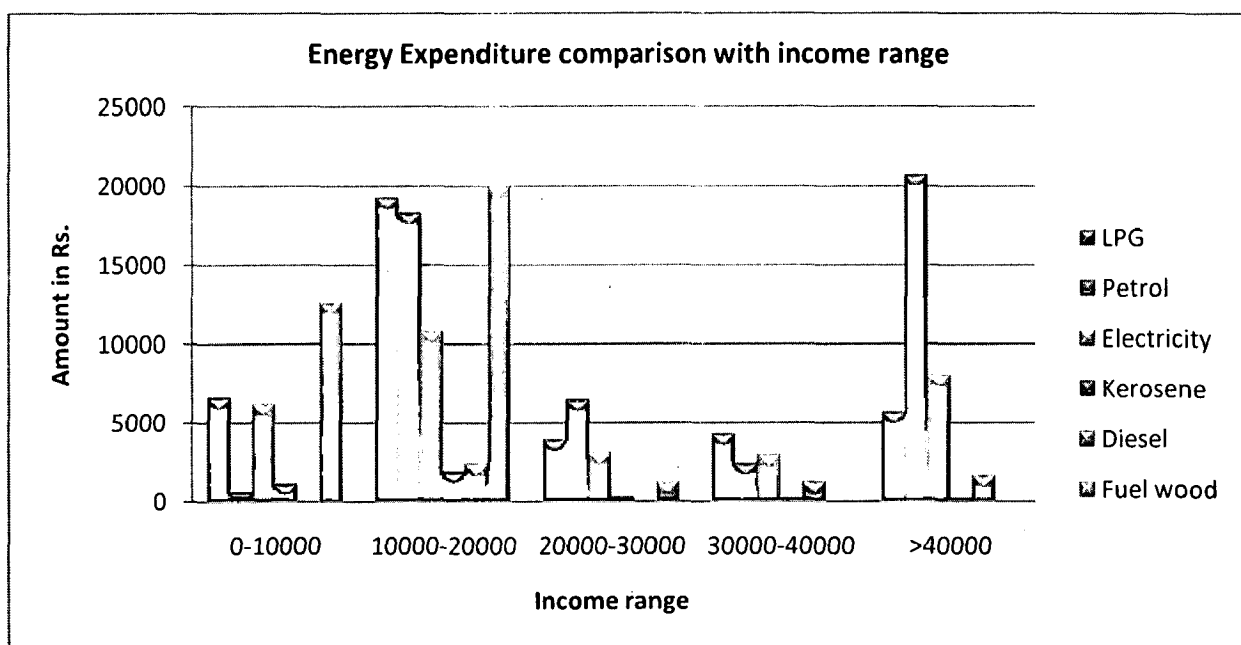


Table 5.22: Energy Expenditure with Income Range

5.10.1 EXPENDITURE ON LPG: Energy consumption for cooking gives an idea about cooking activities in the system. Amount of money spent towards energy for cooking shows the economic standard of the people and the quality of living available in the system. Generally, the economically well off people use liquefied petroleum gas (LPG) for cooking, which is the clean and costly energy, whereas the economically poor prefer the use of fuel-wood, charcoal, etc., which create more smoke and soot in the kitchen that harm the health. Keeping this in mind, the Investigator studied the expenditure pattern for cooking gas.

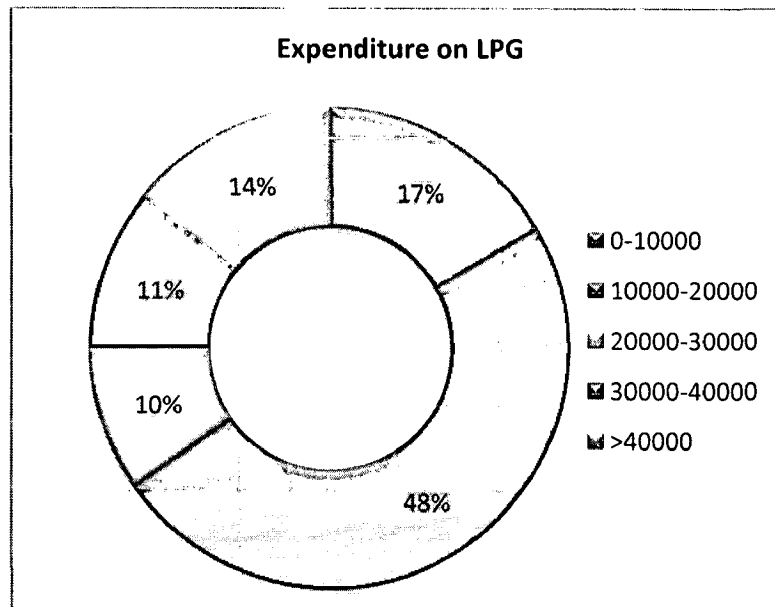


Figure 5.23: Consumption pattern of LPG with income range

It can be observed from the above figure that a little less than half (48 per cent) of the total surveyed households use LPG as their source of energy for cooking purposes. This comes mostly in the income group of 10,000-20,000 which uses 1-2 cylinders of 14.20 kg weight monthly for their cooking needs. Here, near about one fifth (17 per cent) households of the first income range spend on LPG. These are families having only one cylinder along with fuel wood/ firewood used for cooking. Only one tenth (10 per cent) households use LPG as there is Pipeline Gas connectivity in some areas and people with greater affordability prefer Pipeline Gas over LPG. About one tenth (11 per cent) and (14 per cent) of the third and fourth income group have access to both LPG and pipeline gas which is a reason why the LPG expenditure is less as compared to other income ranges.

5.10.2 EXPENDITURE ON PETROL: Expenditure on fuels for travelling purpose depends on availability and extent of use of vehicles in the system. More use of personal vehicles and more expenditure on energy show the economic strength of the people as well as compulsion of the people living in the system. In addition, expenditure for fuel shows commutation requirement of the people for various purposes, such as, working, office, education, social, leisure, etc., The Investigator studied the expenditure on fuel in the system and the results are presented in figure below.

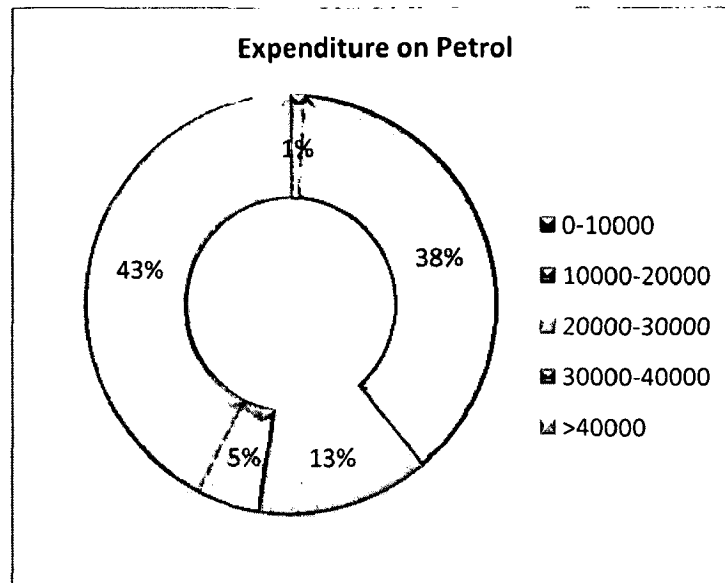


Figure 5.24: Consumption pattern of LPG with income range

The households in the lowest income range of 0-10,000 do not have affordability and hence their petrol expenditure is near negligible. In the second slab, many households use two-wheelers for commutation and conveyance. This is the reason which intrigues a near two fifth (38 per cent) of the total households to spend on petrol. The third income group uses both public transport and personal vehicles for travelling therefore their expenditure ratio is more than one tenth (13 per cent). The total households in the income range of 30,000-40,000 are initially less which implies that already there is a crunch in this group and nearly all the households in this category have two-wheeler or four-wheeler which makes it to 5 per cent. The obvious part of the scenario can be experienced in the last income range. With increasing purchasing and affording power the expense rate of petrol also increases. In the group above 40,000, households have more than one two-wheelers and four-wheelers which leads to almost half of the lot (43 per cent) petrol consumption. Economically solvent households spend more on petrol.

5.10.3 EXPENDITURE ON ELECTRICITY: Power supply is one of the important controlling parameters, which decide the functions of the system. The scarcity of power supply leads the entrepreneurs to move out of the state for setting up of industries and residents. Energy consumption at the household level has the same measure as that of the monthly income of the household. Domestic electricity consumption depends on use of appliances for various purposes in the households. Availability and use of appliances at the household level show economic prosperity,

and the quality of life prevailing in the system. Expenditure for power supply gives an idea about consumption of electricity and the purchasing power of the people for the same in the system. Having this knowledge in mind, the Investigator conducted the survey thoroughly to understand the expenditure pattern in the study area.

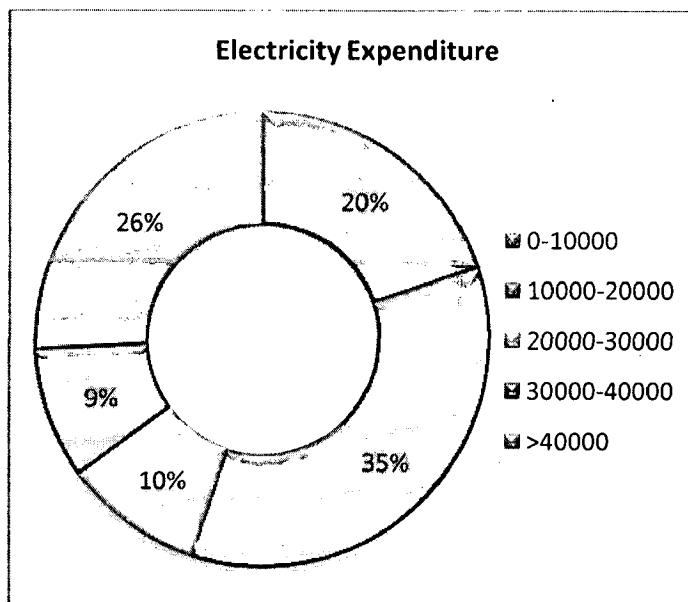


Figure 5.25: Expenditure pattern of Electricity with income range

The electricity connection is available in the study area but due to hurdles like power cut, voltages fluctuations etc. the usage of electricity is greatly impaired and so is the expenditure on it. One fifth (20 percent) of first income group spend on it, more than one third (35 percent) are present in the second category, one fifth (10 percent) in the third category, 9 percent in the fourth and about one fourth (26 percent) above 40,000 spends on electricity. In the first two categories the electricity usage is more because of the occupational pattern of the masses, agriculture requires power and motor pumps for irrigation. In the following income categories, the involvement of various gadgets, AC, Geyser, etc., increase in the expenditure on power in the form of electricity.

5.10.4 EXPENDITURE ON KEROSENE: The investigator has observed from the below fig. that the expenditure on Kerosene is predominant in the first two income groups of 0-10,000 and 10,000-20,000. The ration rate of kerosene in the study area is Rs. 10.00/ litre making it more affordable to the lower income groups. These groups use firewood for cooking and also are dependent on kerosene for stove cooking. In some villages, LPG supply is scarce which leaves no option for the dwellers but to use kerosene. The smoke from the stove cooking is harmful when inhaled. The first income group spend near one third (30 per cent) on kerosene. More than half (53 per

cent) of the total surveyed households come in the second category and has kerosene as their primary expenditure. As the income range increases the expenditure on kerosene also decreases. A very few percentage of households in the higher income range use kerosene for cleaning floors, used as mosquito repellent, burning wastes etc.

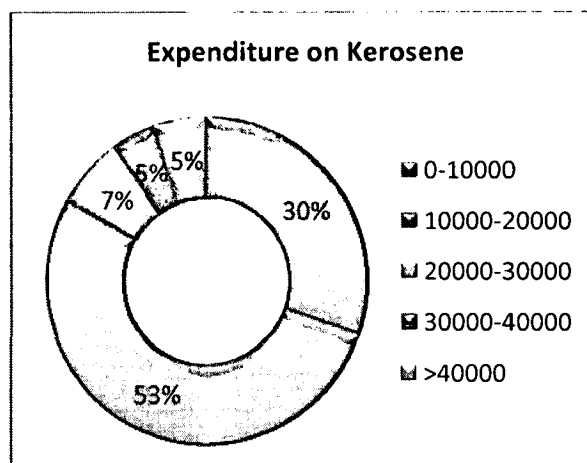


Figure 5.26: Expenditure pattern of Kerosene with income range

5.10.5 EXPENDITURE ON DIESEL: As can be observed from the below drawn figure from the total surveyed households, there are two income ranges not using diesel as source of energy for any purpose. These groups are the income ranges of 0-10,000 and 20,000-30,000 categories. The second income group spends almost about half (46 per cent) as they have tractors and diesel fuelled vehicles which are less expensive. About one fourth (23 per cent) of the total households spend on diesel and around one third (31 per cent) of the last income range earning more than 40,000 rupees have diesel fuelled vehicles. It can be concluded from the analysis that with rising monetary power, more vehicles and private transportation comes in the scenario.

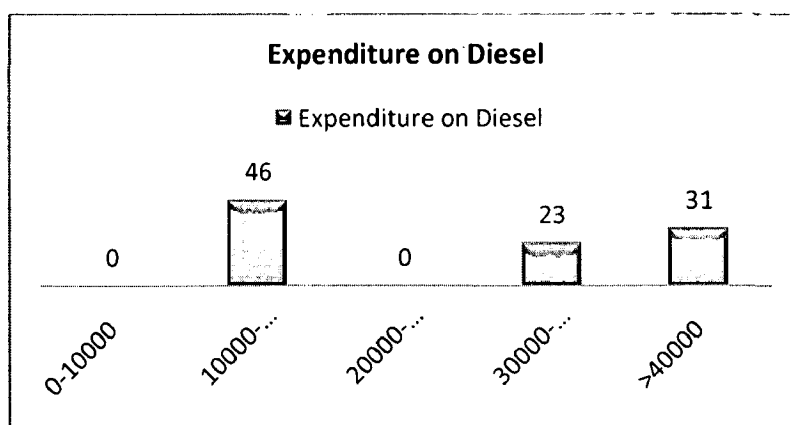


Figure 5.27: Expenditure pattern of Diesel with income range

5.10.6 EXPENDITURE ON FUEL WOOD: The households engaged in the primary sector mainly use fuel wood for cooking and heating. In Tinsukia district, many households working for the Tea-Estates are provided with 200-300 kg of fuel wood monthly by the Tea-Estate companies free of cost. This leads to the savings as against spending on LPG etc. by the households. There are also many villages and households who are not beneficiaries of such perks. It is that group which has to spend on fuel wood. Here more than one third (37 per cent) of the total households spend on fuel wood. Less than two third (59 per cent) in the second income range spend on fuel wood for cooking and heating purposes. With the rising income slab, use of fuel wood diminishes.

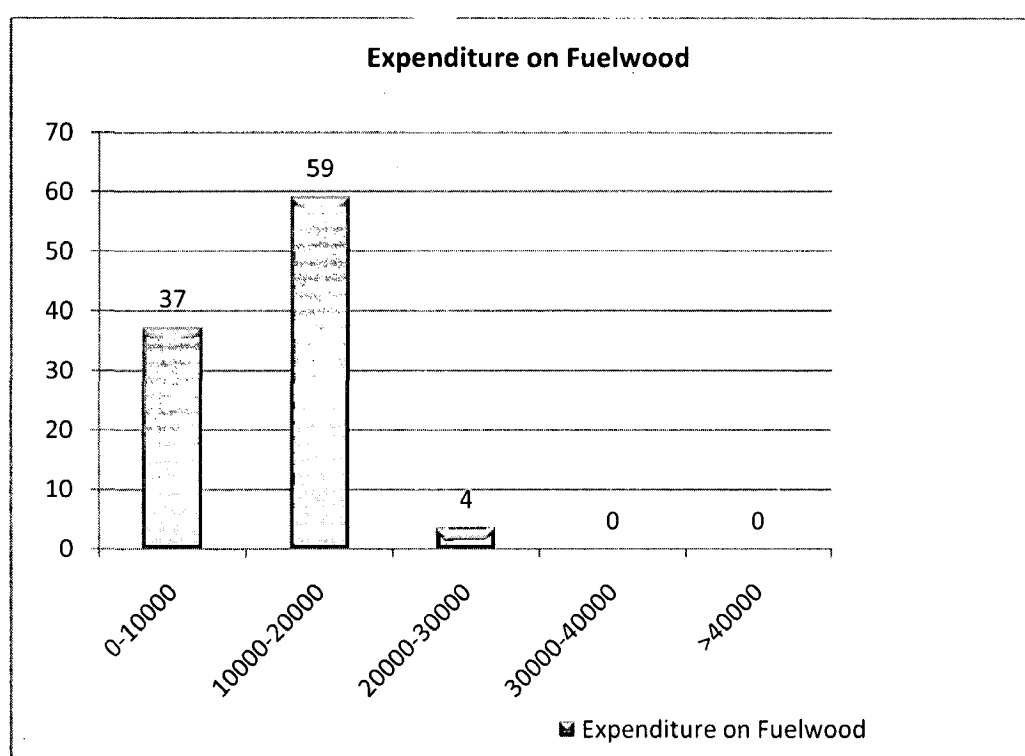


Figure 5.28: Expenditure pattern of Fuel wood with income range

5.11 EXPENDITURE ON PIPELINE GAS: This is a recent development in the north-eastern region and mainly in the district of Tinsukia. Tinsukia district has abundant natural resources in the form of Natural Gas and Oil. It is this resource which is harnessed to produce efficient and eco-friendly gas free of harmful smoke. The Digboi and Makum Oil refineries provide pipeline gas in the major urban city/towns of Tinsukia, Digboi and Margherita. This system is yet to reach the grassroots level of the system but has already taken strong front in energy consumption pattern. The infrastructure required to lay the underground cables carrying natural Pipeline Gas is

enormous but in the long run would be economical. The monthly tariff is Rs. 400 but advance yearly payment can also be done to enjoy the break free benefits of pipeline gas. As there is no metering system, wastage is also on toil. The below drawn table and figure would give a clear picture of the monthly consumption and expenditure on pipeline gas.

Table 5.10: Expenditure on PIPELINE GAS with Income Range

Table No.13 – Pipeline Gas consumption/month (in Rs.) (V13)			
1	2	3	
S.No.	Income	Pipeline Gas consumption/month (in Rs.)	
		Gas	%
1	0-10000	0	0
2	10000-20000	800	12
3	20000-30000	400	6
4	30000-40000	1600	24
5	>40000	4000	59
	TOTAL	6800	100

Source: Primary Household Survey- 2011.

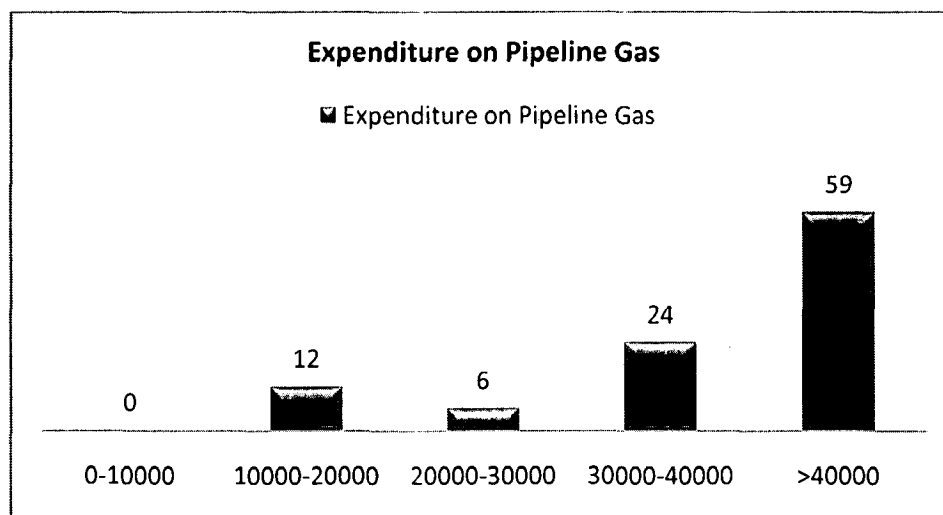


Figure 5.29: Expenditure pattern of Pipeline Gas with income range

In the sample survey, 30 per cent samples/households have been chosen from the urban setup and rest 70 per cent are from the rural system. Therefore, some households in the second income category have access to pipeline gas as they belong to the cities where this facility is available. More than one tenth (12 per cent) of the total households of second income group spend on this amenity on a monthly basis. Due to the gentle number of households in the third income range of 20,000-30,000 the expenditure

percentage by this group is also meagre 6 per cent. In the last two ranges, households have abandoned the use of LPG cylinders and switched over to pipeline gas consumption. Although as back up many households keep single LPG cylinder in case of break down. The fourth income category of 30,000-40,000 spend almost one fourth (24 per cent) on this facility. The households earning more than 40,000 spend almost two third (59 per cent) on pipeline gas supply infrastructure. With better metering and supply system the energy consumption for cooking purpose can be optimized in this region.

5.12 BIOGAS ENERGY: There is extreme potential in the study area to generate energy from biogas and use it as an alternative source of energy. Due to poor infrastructural facilities and lack of effort by the state government in this sector, the development of biogas plant is not successful. All the waste generated by the livestock is used in the farmland instead of manures and fertilizers. This has an impact on the low productivity of the crops. By harnessing the potential of biogas plants, the economy could have been vibrant and flourishing.

5.13 HOUSING: Housing is one of the most important parameters, which decides the functions of the system. Housing is the basic human need, it is not a merely amenity, but essential necessity. A major portion of one's life is spent in the house. Housing constitutes a very important part of the social environment where an individual is natured and where he grows and matures as a citizen. Housing plays a very significant role in improving the national economy, in maintaining the social health and stability and in ensuring the people for a decent life. Having these in mind, an attempt has been made to study various housing characteristics of the surveyed households such as: Physical conditions/ type of house, Tenure, No. of rooms, No. of Floors and Finance for house construction and are presented below.

5.13.1 TYPE OF HOUSE: In the total households surveyed, about one fourth (24 per cent) of the houses are kutcha, another one fourth (26 per cent) are semi-pucca and half (50 per cent) houses are pucca and well built.

Table 5.11: Type of House distribution with Income Range

Table No.14 - Type of House (V17)									
1	2	3						4	
S.No.	Income	Type of House						Total	
		Kutcha	%	Semi-Pucca	%	Pucca	%	No.	%

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1	0-10000	13	54	9	35	6	12	28	28
2	10000-20000	11	46	16	62	15	30	42	42
3	20000-30000	0	0	1	4	7	14	8	8
4	30000-40000	0	0	0	0	8	16	8	8
5	>40000	0	0	0	0	14	28	14	14
	TOTAL	24	100	26	100	50	100	100	100

Source: Primary Household Survey- 2011.

The investigator has tried to present the type of households with respect to their income groups and analyzed the percentage and their dwelling pattern. The agrarian society of the first two income category has kutcha houses. In both the groups the distribution is almost half-half (54 per cent) and (46 per cent) respectively. The same situation is true with semi-pucca dwellings. About one third (35 per cent) have semi pucca houses and are in the first income range. More than three fifth (62 per cent) fall in second range and just 4 per cent come under the third slab. The trend for the pucca houses can be well guessed from this scenario. With the increasing income, households continue living in pucca houses. There is uniformity in the pucca houses and they follow the general rules of economic well being.

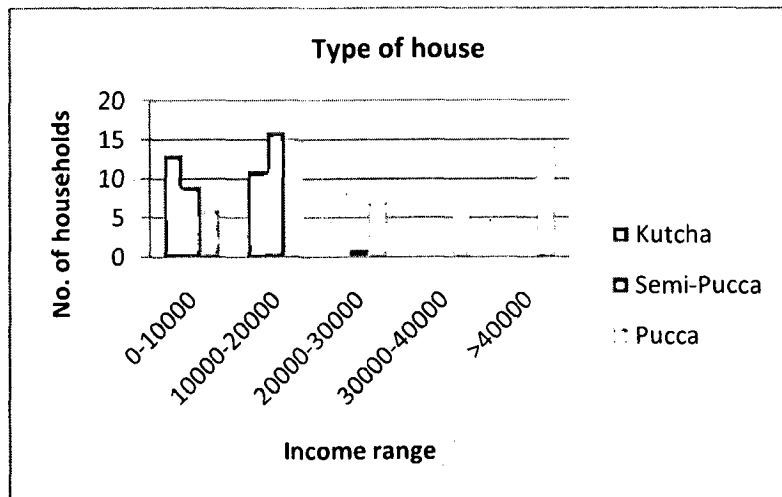


Figure 5.30: Type of house distribution with income range

5.13.2 AGE OF HOUSE: The status of the housing tenure has been examined and the results are presented in Table and the Figure respectively. The broad housing scenario in terms of its age and people living in it can be understood from the table below. There are more than one fourth (27 per cent) houses in the system which is 0-10 yrs old, almost one third (34 per cent) houses 10-20 yrs old, above one fourth (27 per cent) houses which are in the 20-3 years range, just 7 percent houses which are 30-40 yrs and very less number of houses above 40 years. The pattern of age of houses increases till the second bar and then follows a reverse trend. This means that the

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settlement is trying to establish itself. All the ancient/ancestral houses are abandoned and people are trying to build their own houses by commensurate.

Table 5.12: Age of House distribution with Income Range

Table No. 15- Age of House (V14)													
1	2	3										4	
S.No.	Income	Age of House										Total	
		(0-10) yrs	%	(10-20) yrs	%	(20-30) yrs	%	(30-40) yrs	%	> 40 yrs	%	No.	%
1	0-10000	4	15	15	44	1	4	4	57	4	80	28	28
2	10000-20000	14	52	8	24	18	67	2	29	0	0	42	42
3	20000-30000	2	7	2	6	2	7	1	14	1	20	8	8
4	30000-40000	3	11	1	3	4	15	0	0	0	0	8	8
5	>40000	4	15	8	24	2	7	0	0	0	0	14	14
	TOTAL	27	100	34	100	27	100	7	100	5	100	100	100

Source: Primary Household Survey- 2011.

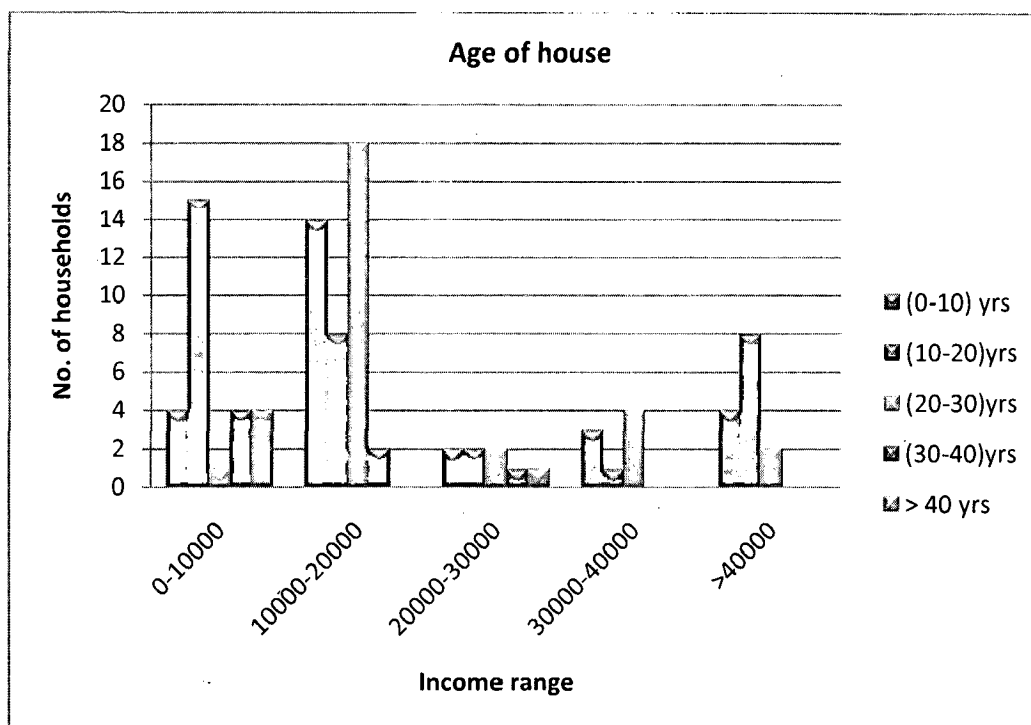


Figure 5.31: Age of house compared to income range

5.13.3 NO. OF ROOMS IN THE HOUSES: This is a measure to identify the income solvency of the households. More wealthy and established households would tend to have more no. of rooms and their quality of life would be better as compared to the lower income groups. In the lower income range, households have more no. of family members but less no. of rooms to accommodate them comfortably. This is a measure showing the quality of life and space that can be achieved by economic stability.

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Table 5.13: No. of rooms distribution with Income Range

Table No. 16 - No. of Rooms (V15)									
1	2	3						4	
S.No.	Income	No. of Rooms						Total	
		1-3 Rooms	%	3-6 Rooms	%	>6 rooms	%	No.	%
1	0-10000	18	55	10	17	0	0	28	28
2	10000-20000	9	27	32	55	1	11	42	42
3	20000-30000	5	15	2	3	1	11	8	8
4	30000-40000	0	0	8	14	0	0	8	8
5	>40000	1	3	6	10	7	78	14	14
	TOTAL	33	100	58	100	9	100	100	100

Source: Primary Household Survey- 2011.

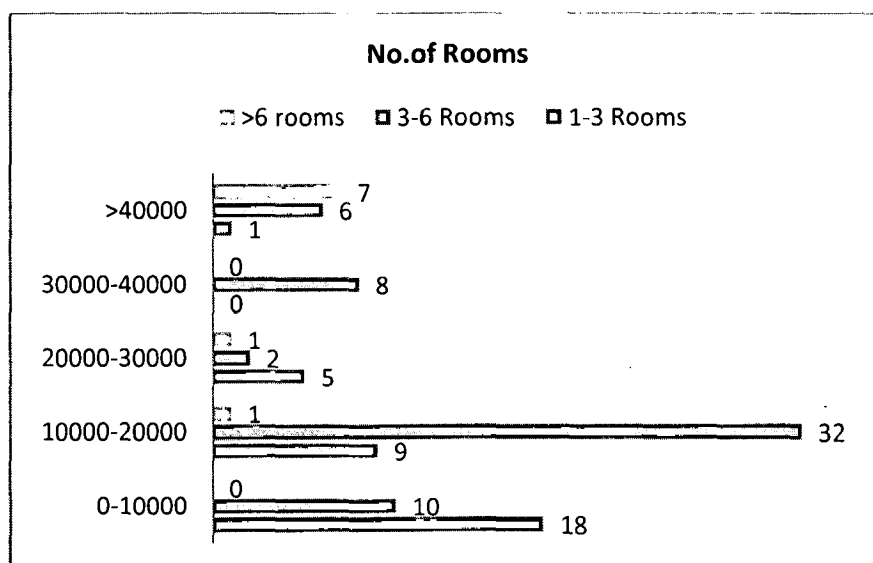


Figure 5.32: No. of Rooms of houses compared to income range

The investigator has observed from the table analysis that in the income range 0-10,000 there are half (55 per cent) of households having 1-3 rooms, one fifth (17 per cent) having 3-6 rooms but no household has more than 6 rooms, although the number of member is more the dwelling is cramped and quality of life is degraded. In the second group, about one third (27 per cent) have 1-3 rooms, almost half (55 per cent) have 3-6 rooms and one tenth (11 per cent) possess above 6 rooms. As the income increases, people can afford better living spaces with more no. of rooms.

Table 5.14: No. of Floors distribution with Income Range

Table No. 17 - No. of Floors(V16)			
1	2	3	4
S.No.	Income	No. of Floors	Total

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		1 Floor	%	2 Floors	%	3 Floors	%	No.	%
1	0-10000	28	32	0	0	0	0	28	28
2	10000-20000	41	47	0	0	0	0	41	41
3	20000-30000	7	8	2	22	0	0	9	9
4	30000-40000	6	7	2	22	0	0	8	8
5	>40000	5	6	5	56	4	100	14	14
	TOTAL	87	100	9	100	4	100	100	100

Source: Primary Household Survey- 2011.

There are nearly eight ninth (87 per cent) households having single floor construction and one ninth (9 per cent) households with double storey houses. This is due to the economy of Tinsukia district and also the higher altitude terrain that pitched roofs are more common as compared to frame structure houses.

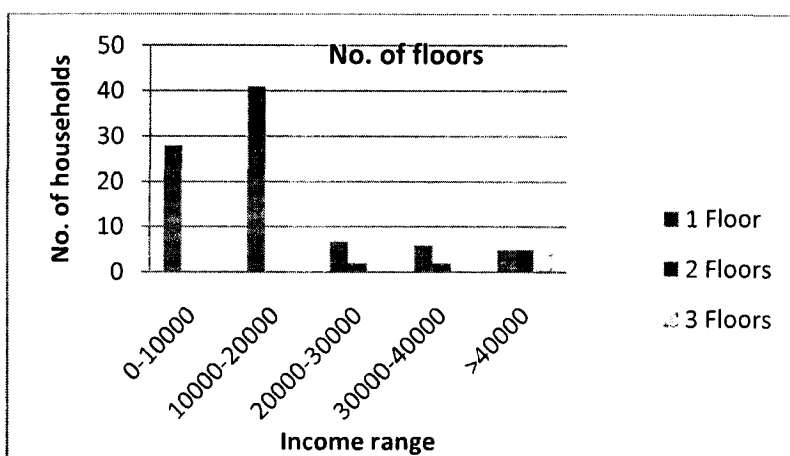


Figure 5.33: No. of Floors of houses compared to income range

5.13.4 FINANCE SOURCES FOR HOUSE CONSTRUCTION: This is one important parameter of study and the investigator has tried to present the scenario of the study area. There about one tenth (10 per cent) households who have taken assistance from the banks to build their houses. This implies that people seeking financial services from the institutions are more in the higher income group because with improved monthly pay people tend to spend more on physical comfort and construct frame structure houses with more no. of rooms. Households taking bank assistance are increasing from income category one to five exponentially. There are three fourth (74 per cent) households who have built their houses on their own expenses and just 16 per cent households who have inherited their ancestral property.

Table 5.15: Finance sources with Income Range

Table No.18 - Finance for house construction (V18)			
1	2	3	4

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S.No.	Income	Finance for house construction						Total	
		Bank	%	Self	%	Ancestral	%	No.	%
1	0-10000	0	0	25	34	3	19	28	28
2	10000-20000	1	10	29	39	12	75	42	42
3	20000-30000	0	0	7	9	1	6	8	8
4	30000-40000	3	30	5	7	0	0	8	8
5	>40000	6	60	8	11	0	0	14	14
	TOTAL	10	100	74	100	16	100	100	100

Source: Primary Household Survey- 2011.

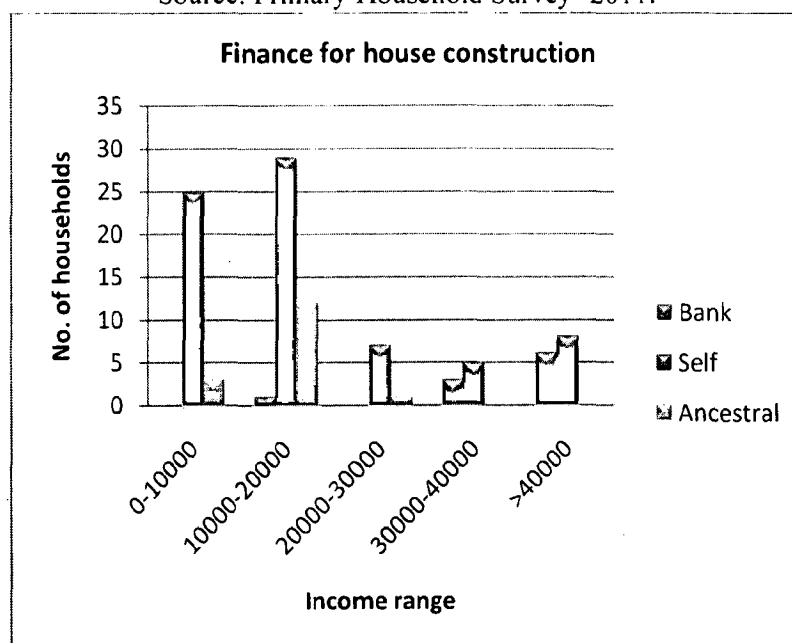


Figure 5.34: Finance sources for house construction with income range

5.14 INFRASTRUCTURE: Cities, towns, and urban agglomerations are expanding faster in most of the regions of the world than the overall growth of the population, due to availability of infrastructure services in the particular system. Infrastructure is divided into three types, which include physical, economic and social infrastructure. These entire three infrastructures are very much essential for the development of the urban system. In India, the urban system which has more infrastructure services developed further, and continuously growing with higher intensity, whereas the urban system has less infrastructure services grows with less intensity. Having the above in mind, the investigator studied the physical infrastructure among the survey households which include transportation, water supply, electricity, sewerage, drainage, waste management and are presented in the following sequence.

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The trend follows an increase with the increase in income, halts for the third category and then again increases with income.

Table 5.17: Road condition with Income range

Table No. 20 - Road Condition (V21)							
1	2	3				4	
S.No.	Income	Road Condition				Total	
		Kutcha	%	Pucca	%	No.	%
1	0-10000	20	37	8	17	28	28
2	10000-20000	29	54	13	28	42	42
3	20000-30000	5	9	3	7	8	8
4	30000-40000	0	0	8	17	8	8
5	>40000	0	0	14	30	14	14
	TOTAL	54	100	46	100	100	100

Source: Primary Household Survey- 2011.

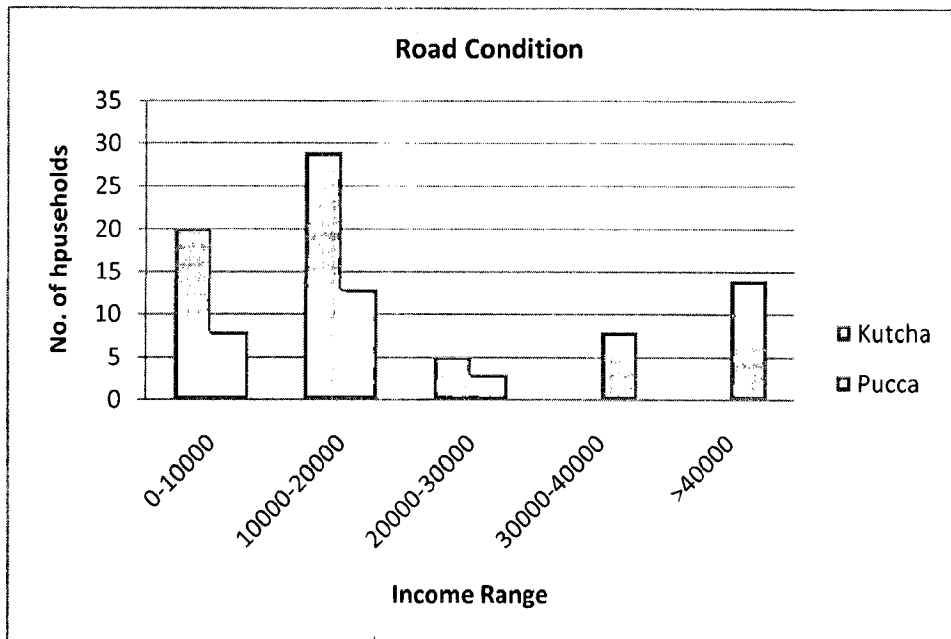


Figure 5.37: Road condition with Income range

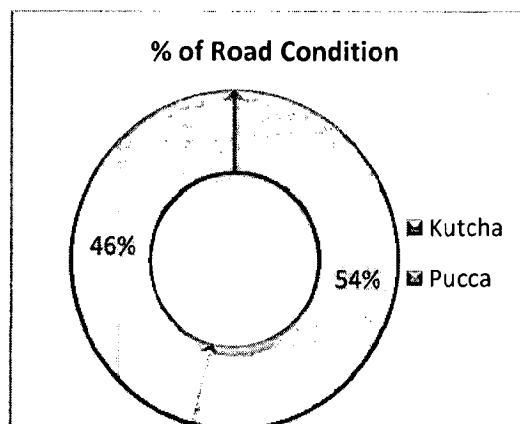


Figure 5.38: % distribution of Road condition

5.15.3 MAINTENANCE OF ROADS: Here, more than one third (36 per cent) roads are well maintained, around two fifth (43 per cent) are bad and remaining one fifth (21 per cent) is worse. The maintenance of road plays a key role in the development of the economy. With better road and transportation the system would flourish and with poor infrastructure economy remains stagnant.

Table 5.18: Maintenance of Road with Income range

Table No. 21 – Maintenance of Road (V22)									
1	2	3						4	
S.No.	Income	Maintenance of Road						Total	
		Good	%	Bad	%	Worse	%	No.	%
1	0-10000	9	25	10	23	8	38	27	27
2	10000-20000	11	31	19	44	13	62	43	43
3	20000-30000	1	3	7	16	0	0	8	8
4	30000-40000	7	19	1	2	0	0	8	8
5	>40000	8	22	6	14	0	0	14	14
	TOTAL	36	100	43	100	21	100	100	100

Source: Primary Household Survey, 2011

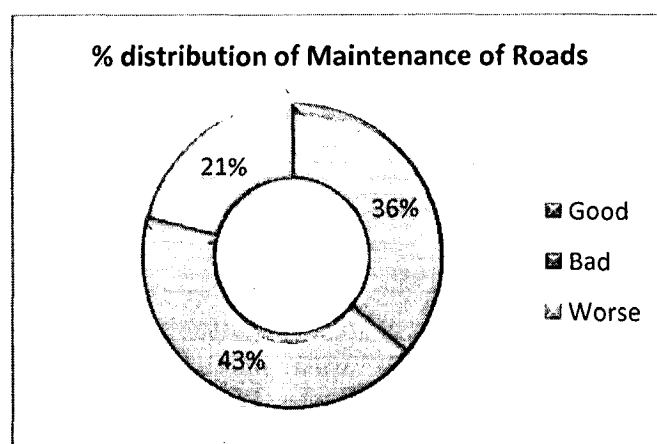


Figure 5.39: % distribution of Maintenance of Road

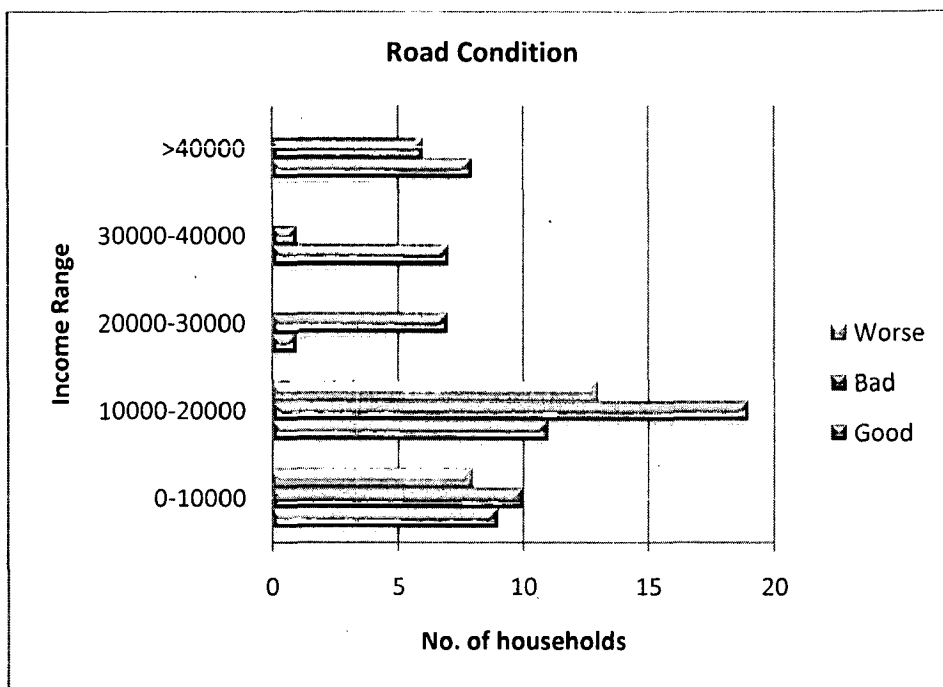


Figure 5.40: Maintenance of Road with Income range

5.16 WORK ACTIVITY:

5.16.1 MODE OF TRANSPORT: In this area, more than one third (36 percent) people travel by walking and by public transport and less than one third (28 percent) use their own vehicles for commutation.

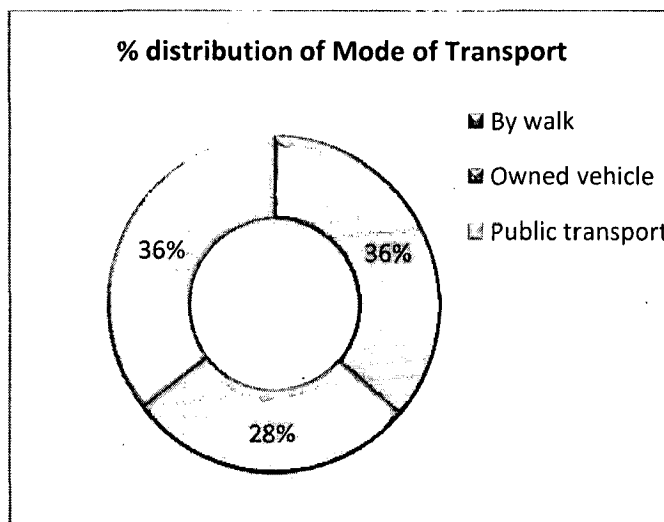


Figure 5.41: % distribution of Mode of transport

Table 5.19: Mode of transport with Income range

Table No. 22 - Work Activity (mode of transport) (V23 a)			
1	2	3	4
S.No.	Income	Work Activity (mode of transport)	Total

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		By walk	%	Owned vehicle	%	Public transport	%	No.	%
1	0-10000	28	28	15	19	28	29	71	26
2	10000-20000	42	42	33	42	42	43	117	42
3	20000-30000	8	8	8	10	6	6	22	8
4	30000-40000	8	8	8	10	8	8	24	9
5	>40000	14	14	14	18	14	14	42	15
	TOTAL	100	100	78	100	98	100	276	100
	PERCENTAGE	36		28		36		100	

Source: Primary Household Survey, 2011.

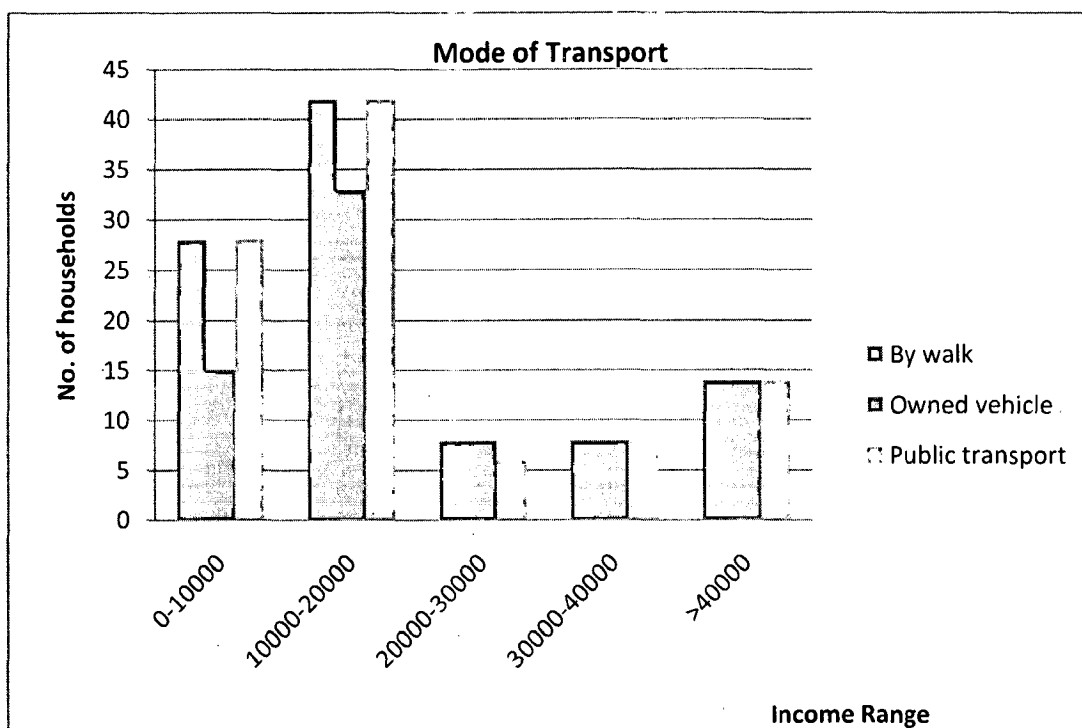


Figure 5.42: Mode of transport with Income range

The investigator has analyzed from the above table and figure that families with lower income range commute more by walking and public transportation and less families travel greater distances on their own vehicles. As the second income group is engaged in various occupational sectors it uses all the three modes of transport equally. The highest income group also uses all three modes as they have to travel larger distances for their work activities. Only the middle two income groups are mostly dependant on their private vehicles for travelling to their work places. It is also possible that they live near their work areas and the need to travel greater distances does not arise.

5.16.2 DISTANCE TRAVELLED: It has been found out that more than two third (72 per cent) of the total families live within 0-10 km from their work areas. Less than one fourth (24 per cent) go to a distance 10-20 km for work and just 4 per cent households travel distances greater than 20 km.

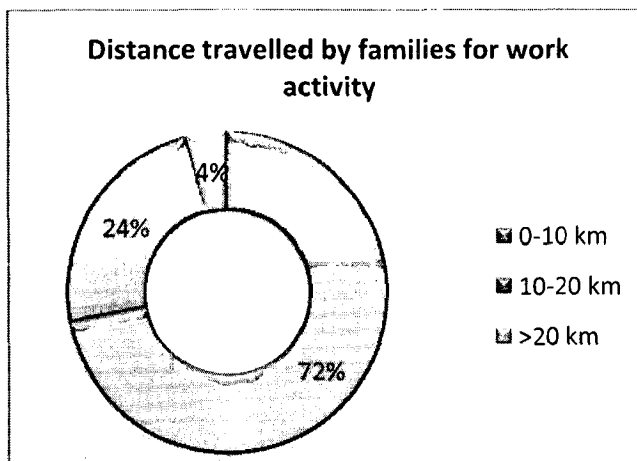


Figure 5.43: Distance travelled by families for work activity

Table 5.20: Distance travelled with Income range

Table No. 23 - Work Activity (Distance in km.) (V23 b)									
1	2	3						4	
S.No.	Income	Work Activity (Distance in km.)						Total	
		0-10 km	%	10-20 km	%	>20 km	%	No.	%
1	0-10000	23	32	5	21	0	0	28	28
2	10000-20000	23	32	19	79	0	0	42	42
3	20000-30000	8	11	0	0	0	0	8	8
4	30000-40000	8	11	0	0	0	0	8	8
5	>40000	10	14	0	0	4	100	14	14
	TOTAL	72	100	24	100	4	100	100	100

Source: Primary Household Survey, 2011.

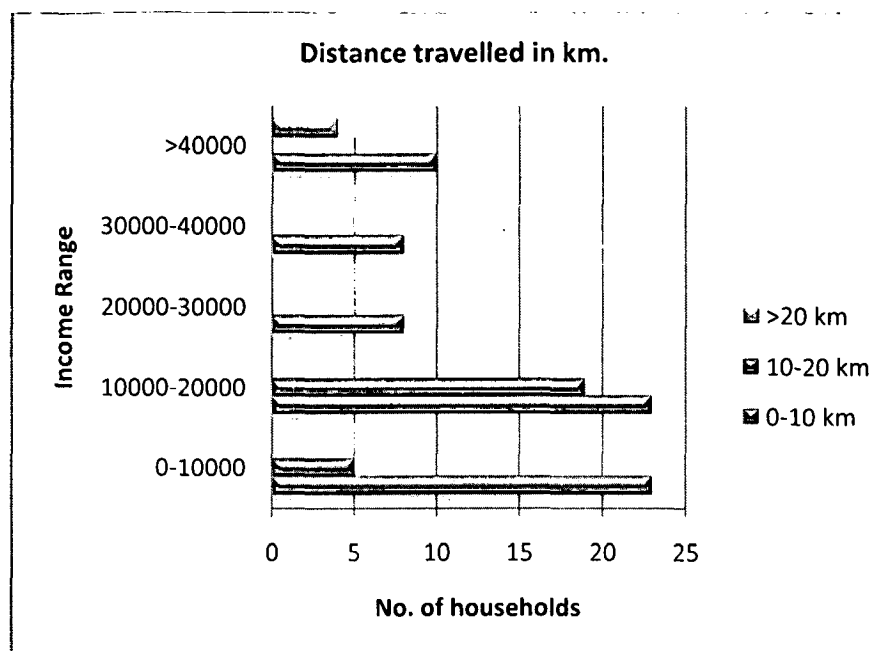


Figure 5.44: Distance travelled with Income range

5.16.3 FREQUENCY IN WEEK: In the study area, seven ninth (78 per cent) of the working people visit their work places 6 days a week and remaining 22 per cent (mostly farm workers) visit their farmlands every day.

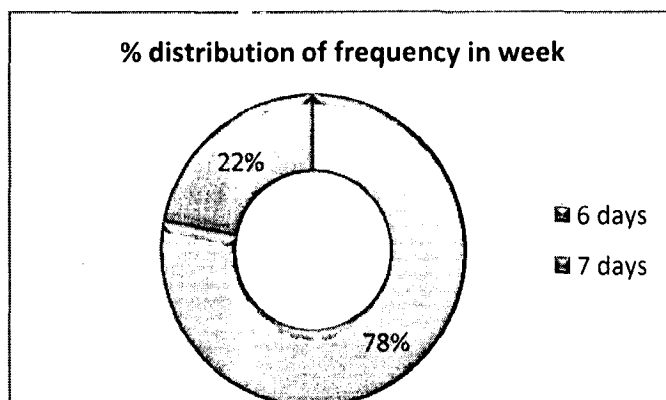


Figure 5.45: Weekly working frequency

Table 5.21: Weekly frequency with income range

1 S.No.	2 Income	3 Work Activity (Frequency in week)				4 Total	
		6 days	%	7 days	%	No.	%
1	0-10000	26	33	2	9	28	28
2	10000-20000	33	42	9	41	42	42
3	20000-30000	7	9	1	5	8	8
4	30000-40000	2	3	6	27	8	8
5	>40000	10	13	4	18	14	14
	TOTAL	78	100	22	100	100	100

Source: Primary Household Survey, 2011

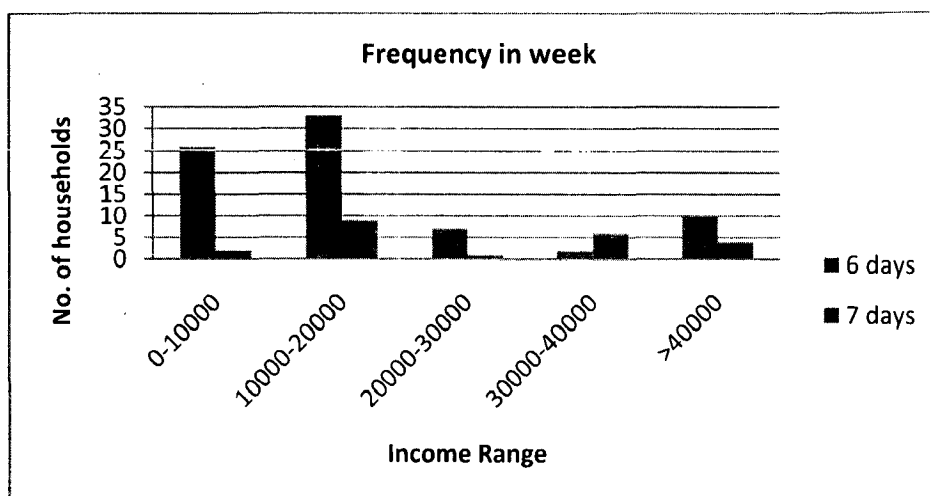


Figure 5.46: Weekly frequency with income range

5.17 WATER SUPPLY SYSTEM: There is no public water supply system in Tinsukia district. There are few tube-wells and hand pumps provided in each village by the administration. But they are meant for irrigation purpose of the fields. Slightly more than one fourth (28 percent) of the total households have their own water arrangements in the form of hand pumps, wells, etc. Nearly half (42 percent) are in the second income range, less than one tenth (8 percent) form the third and fourth group and 14 percent households have their own means of water supply for drinking purposes. There are many families who have wells, motor pumps and storage containers but the frequency of people having motor pumps is more in the higher income ranges.

Table 5.22: Water Supply System with income range

1	2	3				4	
S.No.	Income	Water Supply System				Total	
		Public Supply	%	Own source	%	No.	%
1	0-10000	0	0	28	28	28	28
2	10000-20000	0	0	42	42	42	42
3	20000-30000	0	0	8	8	8	8
4	30000-40000	0	0	8	8	8	8
5	>40000	0	0	14	14	14	14
	TOTAL	0	0	100	100	100	100

Source: Primary Household Survey, 2011.

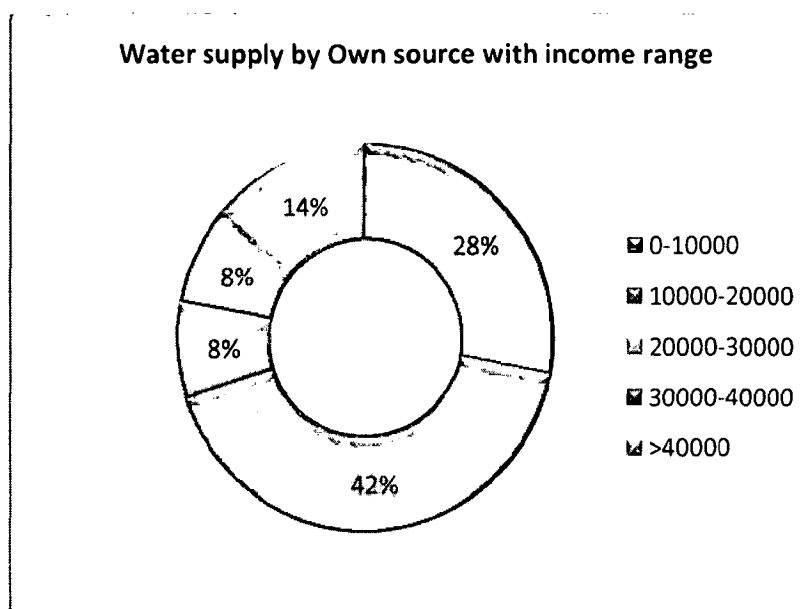


Figure 5.47: Water Supply by own source with income range

5.17.1 WATER SUPPLY SOURCE: The total households having wells is 8 per cent. In this study area, nearly two third (67 per cent) of the total households have hand pumps and one fourth (25 per cent) households has motor pumps as source of water. Motor pumps are also used by the farmers for irrigation purposes with the only difference that many households would commonly have a motor pump. As the income increases, the households employing motor pumps for water supply also increase. In case if hand pump, almost every household have a hand pump in spite of having other water supply sources.

Table 5.23: Water Supply Sources with income range

1	2	3						4	
S.No.	Income	Water Supply Source						Total	
		Well	%	Hand Pump	%	Motor Pump	%	No.	%
1	0-10000	1	8	28	28	5	14	34	23
2	10000-20000	7	58	42	42	10	27	59	40
3	20000-30000	1	8	7	7	4	11	12	8
4	30000-40000	1	8	8	8	4	11	13	9
5	>40000	2	17	14	14	14	38	30	20
	TOTAL	12	100	99	100	37	100	148	100
	PERCENTAGE	8		67		25		100	

Source: Primary Household Survey, 2011.

5.18 ELECTRICITY: The critical role of power in spurring economic growth is undisputed. The per capita energy consumption rate of a country is an indicator of economic development of a country. This clearly shows that power is one of the most important factors, which control the functions of the system. Further, the regular power supply of desired quality is also indicator of quality of life a city. Keeping this knowledge in mind, an attempt has therefore been made to analyse the type of service, voltage fluctuations and the results are presented below.

Table 5.25: Electricity with income range

Table No. 28 - Electricity (V28 a)							
1	2	3				4	
S.No.	Income	Electricity				Total	
		Metered	%	Non-Metered	%	No.	%
1	0-10000	27	27	1	100	28	28
2	10000-20000	42	42	0	0	42	42
3	20000-30000	8	8	0	0	8	8
4	30000-40000	8	8	0	0	8	8
5	>40000	14	14	0	0	14	14
	TOTAL	99	100	1	100	100	100

Source: Primary Household Survey, 2011.

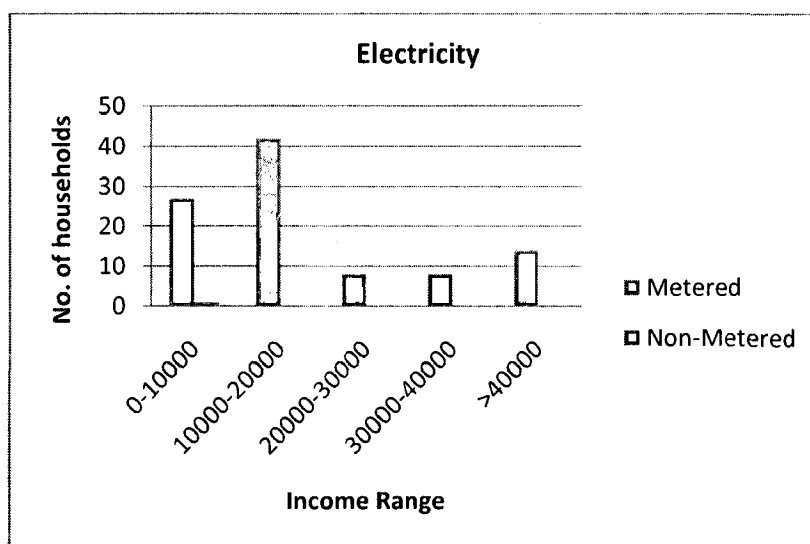


Figure 5.52: Electricity with income range

The electricity supply in Tinsukia district is 99 per cent metered and amongst the sample survey, only one household was found having non-metered connection.

5.18.1 Overhead poles: All the 100 households of the study had overhead poles for electricity connection.

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5.18.2 Voltage Fluctuation: Nearly, one third (32 per cent) of the households in the income range 0-10,000 suffer voltage fluctuation and almost half (47 per cent) have same problem and are of the second income range. The higher groups face less voltage fluctuation problems. There is enormous water power potential in this region but due to lack to proper harnessing electricity has to be purchased from other districts and states. It is evident that the study area does not have continuous power supply in the system and the level and quality of electricity infrastructure needs to be improved.

Table 5.26: Voltage Fluctuation with income range

Table No. 29 - Voltage Fluctuation (V28 c)			
1	2	3	
S.No.	Income	Voltage Fluctuation	
		No. of households	%
1	0-10000	24	32
2	10000-20000	36	47
3	20000-30000	3	4
4	30000-40000	6	8
5	>40000	7	9
	TOTAL	76	100

Source: Primary Household Survey, 2011.

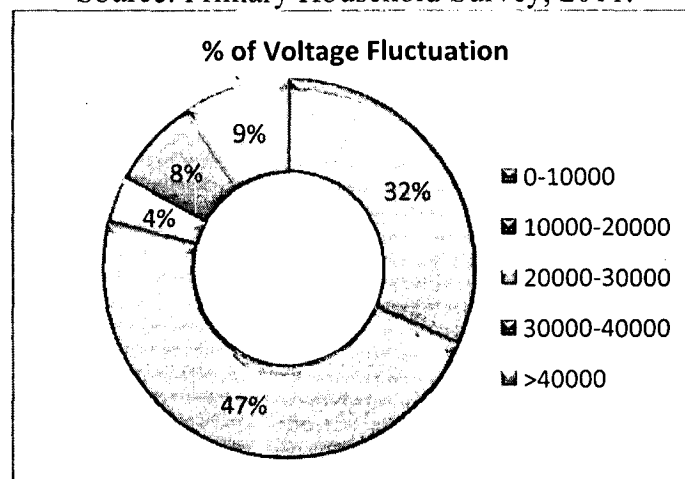


Figure 5.53: Voltage fluctuation with income range

5.18.3 Duration of power cuts (in hours):

Table 5.27: Duration of power cuts with income range

Table No. 30 - Duration of Power Cuts in hrs. (V28 d)									
1	2	3						4	
S.No.	Income	Duration of Power Cuts in hrs.						Total	
		0-4 hrs	%	4-8 hrs	%	>8 hrs	%	No.	%
1	0-10000	9	41	11	21	8	31	28	28
2	10000-20000	8	36	15	29	18	69	41	41

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3	20000-30000	2	9	7	13	0	0	9	9
4	30000-40000	0	0	8	15	0	0	8	8
5	>40000	3	14	11	21	0	0	14	14
	TOTAL	22	100	52	100	26	100	100	100

Source: Primary Household Survey, 2011.

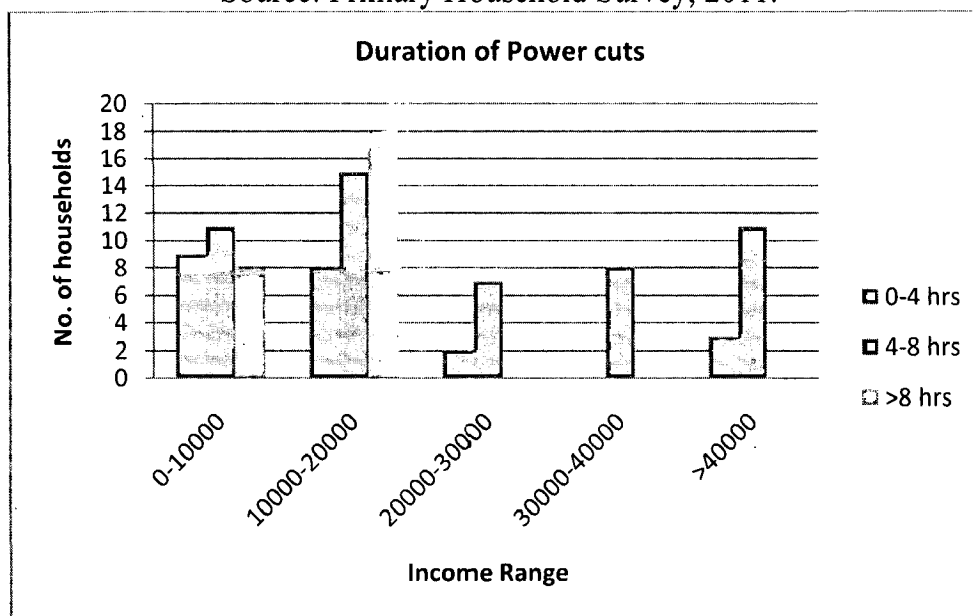


Figure 5.54: Duration of power cuts with income range

In the total surveyed area, about half (52 per cent) of the families experience power cut for 4-8 hours. One fourth (26 per cent) households suffer power cuts for more than 8 hours and only 22 per cent have it for maximum 4 hours. In the urban setup, power cuts are in the range of 0-4 hours but with the location difference the duration of cuts increases. This shows that the system is not stable and the functioning is hampered by many means.

5.19 SEWERAGE: Sewerage is also one of the important parameter of the function of the system and is a standard of physical infrastructure. The development level of any system can be judged by the sewerage facilities availability in the system. Any flourishing economy would have proper sewerage management. Having these in mind, the investigator examined the waste management among survey households for different income groups and is presented in the following sequence.

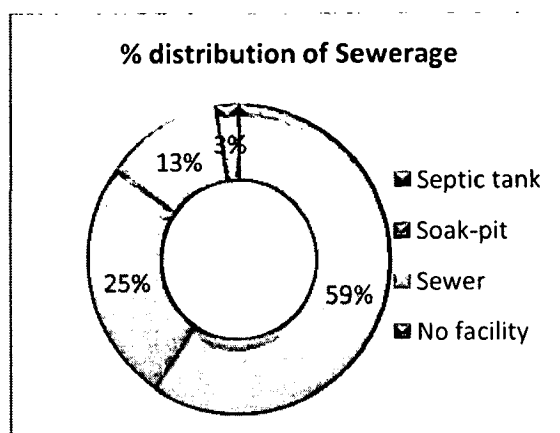


Figure 5.55: Distribution of Sewerage

It can be observed from the above figure that about three fifth (59 per cent) households have septic tank, one fourth (25 per cent) have soak-pit facility, about one tenth (13 per cent) have direct connection to the sewers and 3 per cent households have no facility of sewerage. Sewer facility is confined mostly to the higher income group who have constructed pucca drains connecting the main sewer lines. This group (above 40,000) has three fourth (73 per cent) of the total with sewer facility. The existence of septic tank can be observed in almost all the income ranges and soak –pits are mostly found in lower income group of the rural system. The provision of sound sewerage system is very essential as clean sewerage system leads to healthy living and improves the quality of life.

Table 5.28: Sewerage disposal sources with income range

1	2	3								4	
S.No.	Income	Sewerage								Total	
		Septic tank	%	Soak-pit	%	Sewer	%	No facility	%	No.	%
1	0-10000	12	17	16	53	0	0	2	67	30	25
2	10000-20000	28	40	14	47	0	0	1	33	43	36
3	20000-30000	8	11	0	0	0	0	0	0	8	7
4	30000-40000	8	11	0	0	4	27	0	0	12	10
5	>40000	14	20	0	0	11	73	0	0	25	21
	TOTAL	70	100	30	100	15	100	3	100	118	100
	PERCENTAGE	59		25		13		3		100	

Source: Primary Household Survey, 2011.

DYNAMIC FEATURES OF THE STUDY AREA

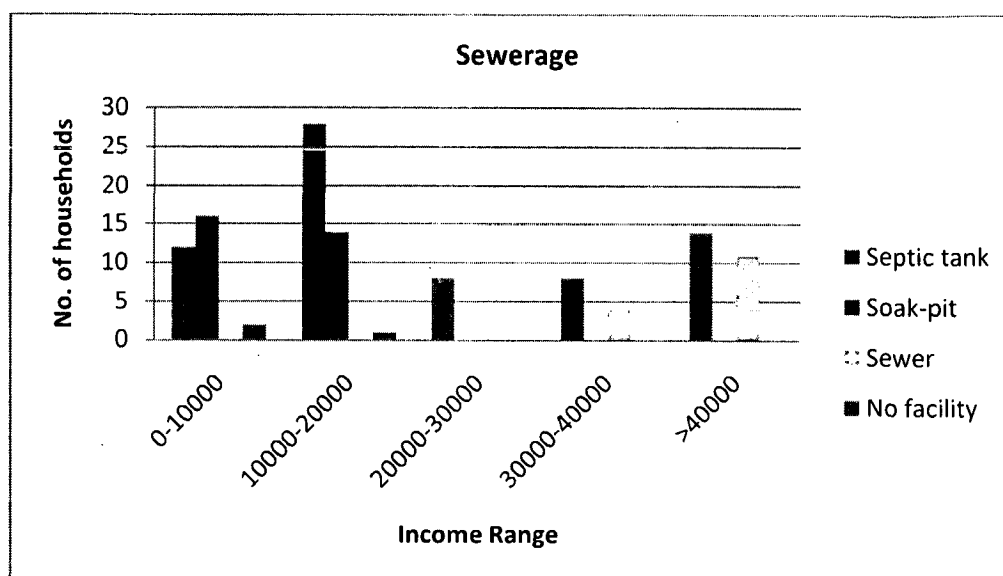


Figure 5.56: Sewerage disposal sources with income range

5.20 DRAINAGE: There are three fifth (61 per cent) households having open drains, near one third (31 per cent) have covered drains and only 8 per cent does not have drains at all. The frequency of open drains descends from the first income range towards the last income range. The covered drains are more in the medium earning group and the last slab. The households with lower income range and in the rural system have no facility for drains. The hygienic condition of these households is in doldrums and urgent attention of the administration is required.

Table 5.29: Drainage Pattern with income range

Table No. 34 - Drainage (V30)									
1	2	3						4	
S.No.	Income	Drainage						Total	
		Open	%	Covered	%	No drains	%	No.	%
1	0-10000	19	31	4	13	5	63	28	28
2	10000-20000	26	43	13	42	3	38	42	42
3	20000-30000	7	11	1	3	0	0	8	8
4	30000-40000	6	10	2	6	0	0	8	8
5	>40000	3	5	11	35	0	0	14	14
	TOTAL	61	100	31	100	8	100	100	100

Source: Primary Household Survey, 2011.

DYNAMIC FEATURES OF THE STUDY AREA

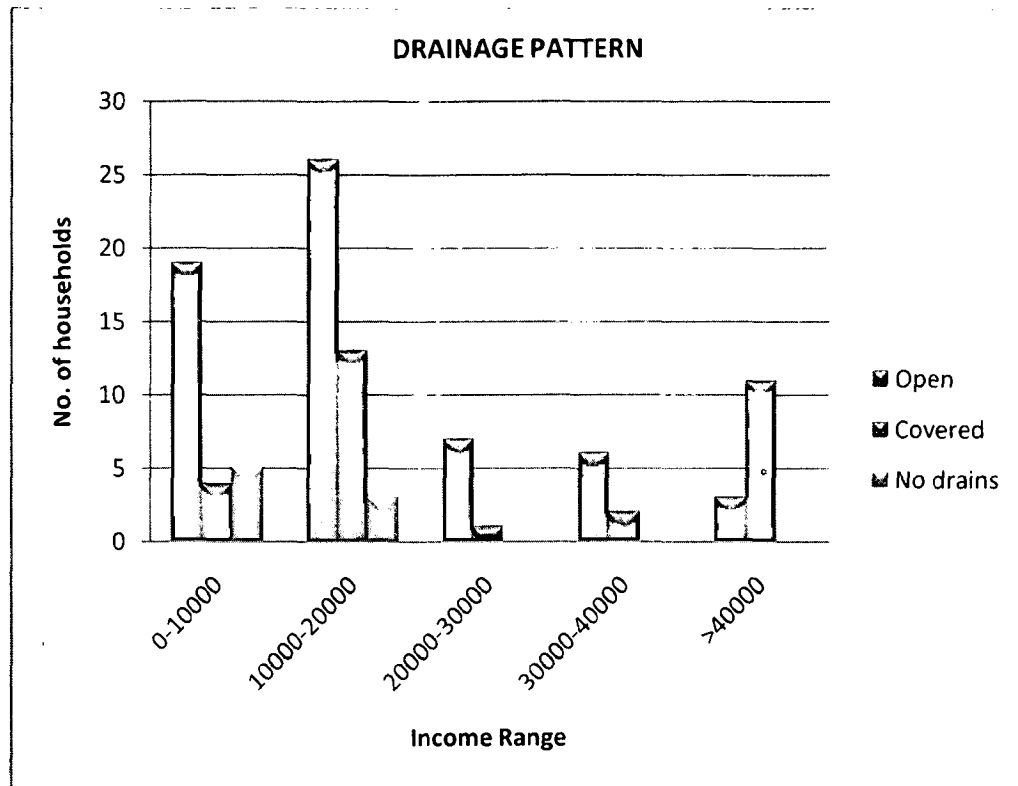


Figure 5.57: Drainage Pattern with income range

5.20.1 DRAINAGE PROBLEMS: Here, more than one third (36 per cent) of the households have the problem of overflowing drains, 30 per cent faces drain clogging, 22 per cent adjusts with the bad odour from the open drains. There are just one tenth (13 per cent) households who do not face any drainage problems.

Table 5.30: Drainage Problems with income range

Table No.35 - Drainage Problems (V31)											
1	2	3								4	
S.No.	Income	Drainage problems								Total	
		Overflow	%	Clogging	%	Bad Odour	%	No Problems	%	No.	%
1	0-10000	23	34	18	32	11	27	4	17	56	30
2	10000-20000	31	46	24	43	16	39	4	17	75	40
3	20000-30000	5	7	5	9	5	12	3	13	18	10
4	30000-40000	6	9	6	11	6	15	2	8	20	11
5	>40000	3	4	3	5	3	7	11	46	20	11
	TOTAL	68	100	56	100	41	100	24	100	189	100
	PERCENTAGE	36		30		22		13		100	

Source: Primary Household Survey, 2011.

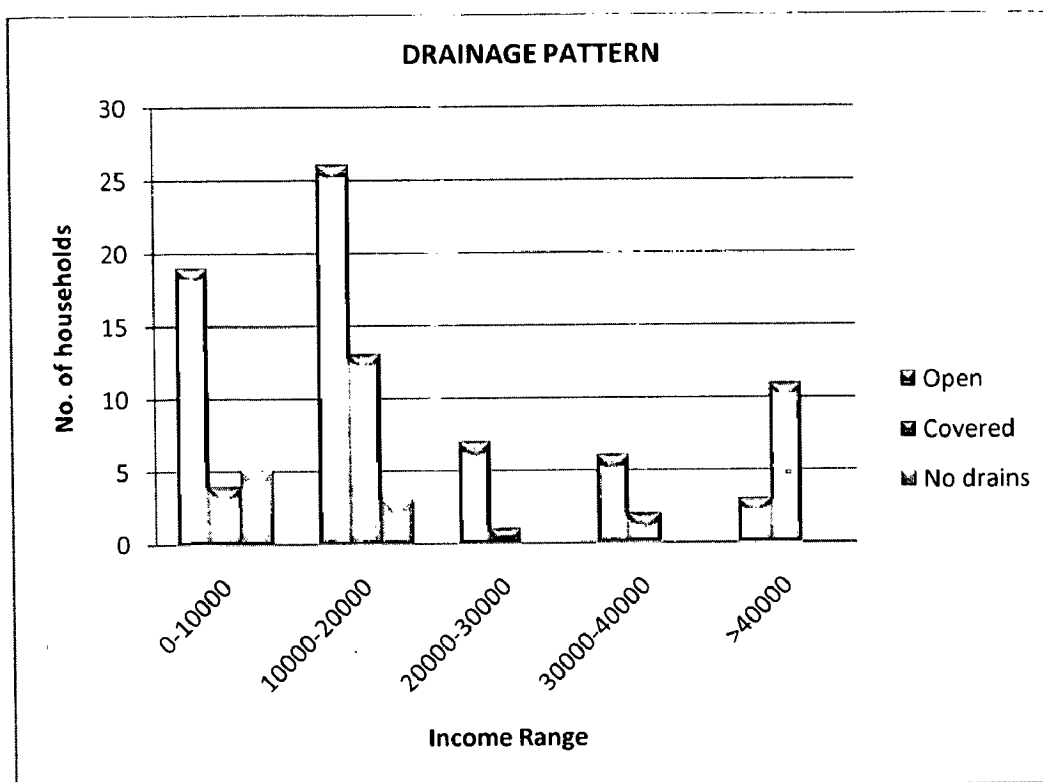


Figure 5.57: Drainage Pattern with income range

5.20.1 DRAINAGE PROBLEMS: Here, more than one third (36 per cent) of the households have the problem of overflowing drains, 30 per cent faces drain clogging, 22 per cent adjusts with the bad odour from the open drains. There are just one tenth (13 per cent) households who do not face any drainage problems.

Table 5.30: Drainage Problems with income range

1 S.No.	2 Income	3 Drainage problems								4 Total	
		Overflow	%	Clogging	%	Bad Odour	%	No Problems	%	No.	%
1	0-10000	23	34	18	32	11	27	4	17	56	30
2	10000-20000	31	46	24	43	16	39	4	17	75	40
3	20000-30000	5	7	5	9	5	12	3	13	18	10
4	30000-40000	6	9	6	11	6	15	2	8	20	11
5	>40000	3	4	3	5	3	7	11	46	20	11
	TOTAL	68	100	56	100	41	100	24	100	189	100
	PERCENTAGE	36		30		22		13		100	

Source: Primary Household Survey, 2011.

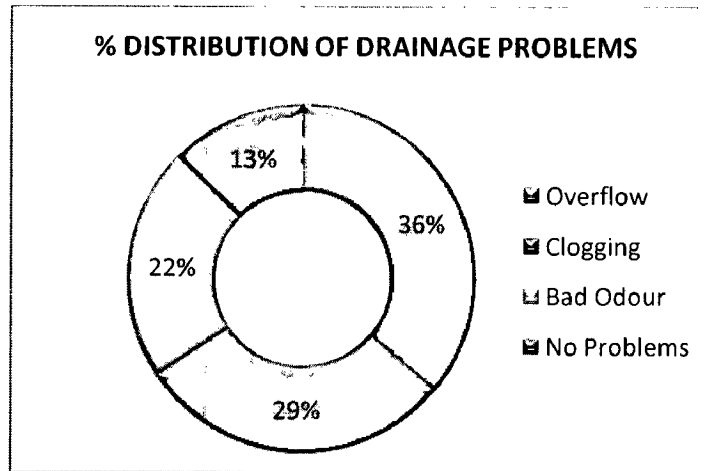


Figure 5.58: Drainage Problems percentage

The households in the first two income groups suffer from most of the drain related problems. The families with higher income and living in the urban system are more close to the services provided by the municipality. The settlements/ villages far off do not have access to Nagar Nigam. The gram panchayats also do not take initiatives to improve the drainage system of the villages. The funds available of village upliftment do not reach the masses, as a result of which they continue to live in degraded conditions.

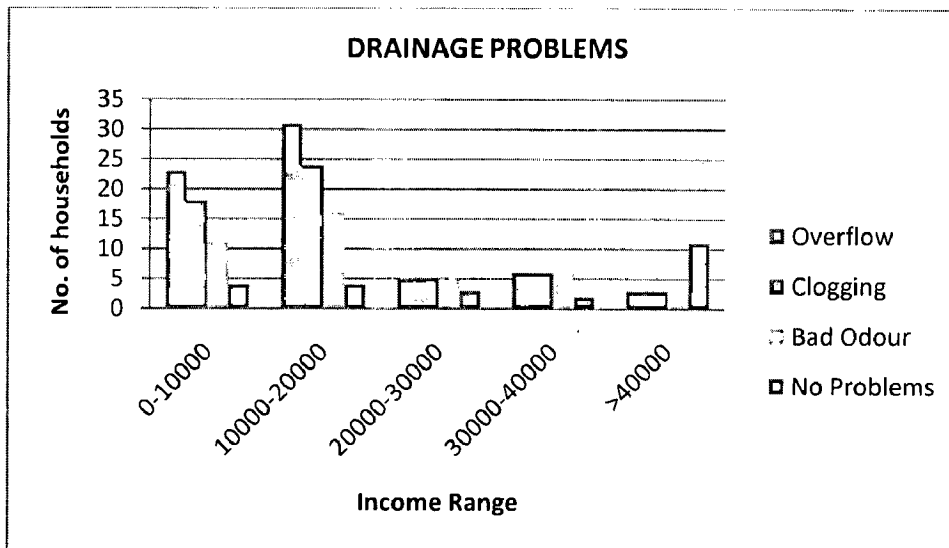


Figure 5.59: Drainage Problems with income range

5.20.2 RAINY SEASON DRAINAGE PATTERN:

Table 5.31: Rainy Season Drainage with income range

Table No. 36 - Rainy Season Drainage (V32)							
1	2	3				4	
S.No.	Income	Rainy Season Drainage				Total	
		Overflow	%	No problem	%	No.	%

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1	0-10000	24	32	4	17	28	28
2	10000-20000	38	50	4	17	42	42
3	20000-30000	5	7	3	13	8	8
4	30000-40000	6	8	2	8	8	8
5	>40000	3	4	11	46	14	14
	TOTAL	76	100	24	100	100	100

Source: Primary Household Survey, 2011.

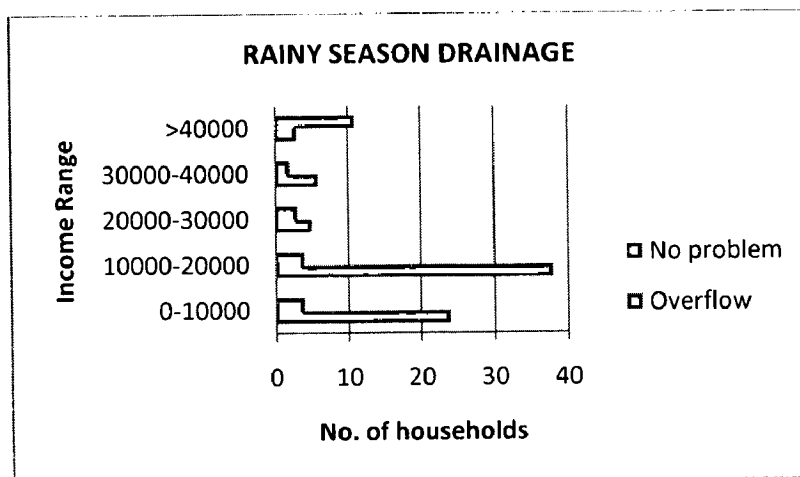


Figure 5.60: Drainage Problems with income range

5.21 WASTE MANAGEMENT METHODS: Waste management is another one of the important parameter, which decides the functions of the system. Municipal solid waste management is an important task now days and the municipal administration face severe threat due to accumulation of wastes, in the urban system. Analyses across the globe over the years reveal that the generation of municipal solid waste is positively related to variations in per capita income, and generation of municipal solid waste per capita does not vary with population size, but comparably vary with per capita income. Having these in mind, the investigator examined the waste management among survey households for different income groups and is presented in the following sequence.

Table 5.32: Waste disposal and collection with income range

Table No.37 - Waste disposal/collection method from house (V33)											
1	2	3								4	
S.No.	Income	Waste disposal/collection method from house								Total	
		Storage Container	%	Dustbin	%	Burning	%	Throwing out	%	No.	%
1	0-10000	0	0	0	0	21	41	28	36	49	31
2	10000-20000	1	14	1	5	28	55	41	53	71	46

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3	20000-30000	1	14	3	14	2	4	3	4	9	6
4	30000-40000	2	29	7	33	0	0	1	1	10	6
5	>40000	3	43	10	48	0	0	4	5	17	11
	TOTAL	7	100	21	100	51	100	77	100	156	100
	PERCENTAGE	4		13		33		49		100	

Source: Primary Household Survey, 2011.

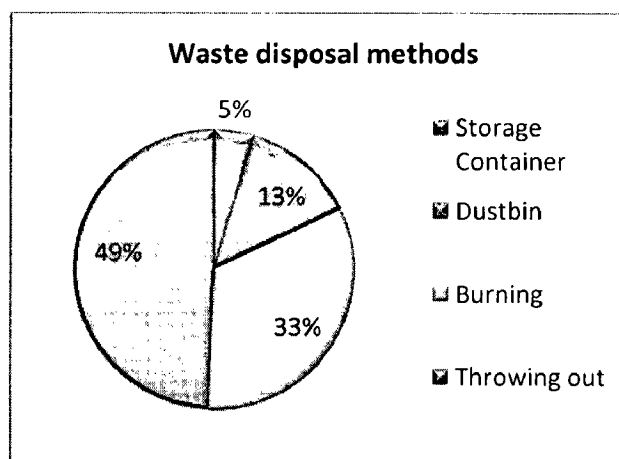


Figure 5.61: Waste disposal and collection percentage

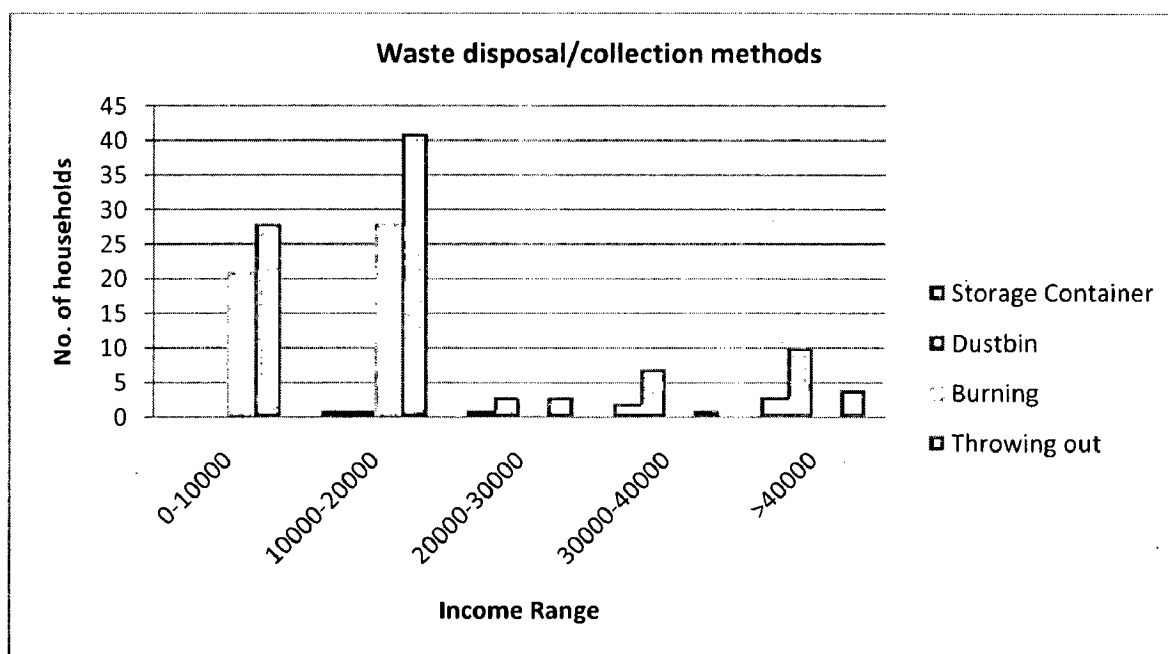


Figure 5.62: Waste disposal and collection with income range

It can be very well summed up from the above table and figures that due to unavailability of storage containers, dustbins and timely cleaning, people tend to dispose off their waste by throwing in the open and by burning. Both these type of disposing poses environmental threat. Just throwing out creates air and water pollution and burning pollutes the air and produces harm smoke. In this sample, nearly half (49 per

cent) households throw off their waste in the open and one third (33 per cent) burns it. Only one tenth (13 per cent) households have dustbins and 5 per cent have storage containers which are weekly cleared by the municipality.

5.22 AGRICULTURE: Agriculture is the one of the most important parameters, which decides the functions of the system. India is an agrarian country and almost two-third of population of India lives in the rural system. Agriculture is the primary source of income in the rural segments, which lead to the development of primary sector of the economy of a particular system. Agriculture output (Production of crops, seeds and vegetables etc.) of the rural system is the input for the survival of urban system. The study area has 3790 Sq.km area, of which 71.90 Sq.km is confined in the urban segments and the rest of the area is confined in the rural system, but the people among these system(both urban and the rural) depend on each other for their survival, since the area is very less. Further, the commutation time is also very less from the rural to urban and back. As a consequence, not much difference is obtained in the rural system compared to the urban system in the study area. Hence, the rural system must be studied along with the urban system, for arriving at plausible decisions.

Paddy is the principle crop amongst the all the crops in the study area. The investigator had tried to access the land area of the study area and the percentage distribution of land ownership is mentioned in the pie chart below. The average land ownership in Tinsukia district is 1.45 hectare as obtained from secondary sources (district statistical handbook). The households having land from 0-10 Ha are five sixth (82 per cent) of the total, one tenth (10 per cent) households have area greater than 30 Ha and 4 percent each of the total households have 10-20 Ha and 20-30 Ha of land area under cultivation.

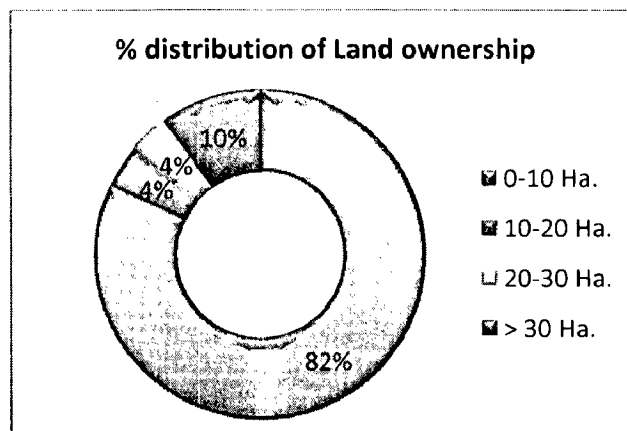


Figure 5.63: Land Ownership distribution with Income Range

Table 5.33: Land Ownership distribution with Income Range

Table No.41 - Total Land ownership (in ha.) (V37)											
1	2	3								4	
S.No.	Income	Total Land ownership (in ha.)								Total	
		0-10 Ha.	%	10-20 Ha.	%	20-30 Ha.	%	> 30 Ha.	%	No.	%
1	0-10000	26	32	0	0	0	0	2	20	28	28
2	10000-20000	26	32	4	100	4	100	8	80	42	42
3	20000-30000	8	10	0	0	0	0	0	0	8	8
4	30000-40000	8	10	0	0	0	0	0	0	8	8
5	>40000	14	17	0	0	0	0	0	0	14	14
	TOTAL	82	100	4	100	4	100	10	100	100	100

Source: Primary Household Survey- 2011.

The families having 0-10 Ha land are more in all the income ranges. Nearly one third (32 per cent) are in the first income group and almost one tenth (10 per cent) come under the rest income groups. There are 4 households in the system who have land are ranging from 10 to 20 hectares, naturally the production from these lands would be greater than the first group combined. The households having huge land chunks like 20-30 Ha and more than 30 Ha contribute four fifth (80 per cent) of the total and come in the income range of 10,000-20,000. Due to urbanization and increasing income, people shift from primary sector to secondary and tertiary sector. The agrarian population mainly come in the first and second income groups.

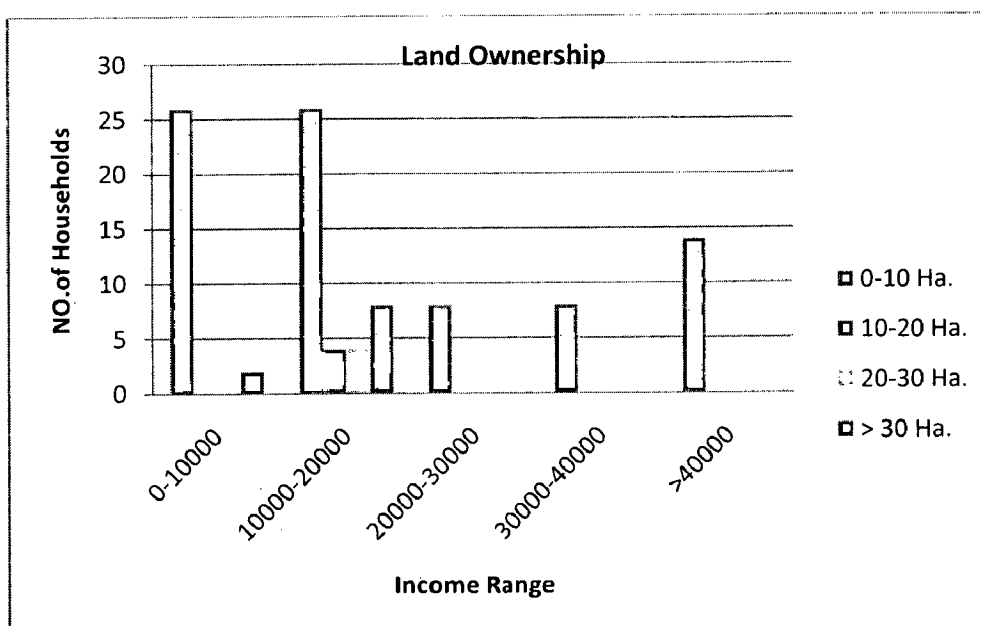


Figure 5.64: Land ownership distribution with Income Range

5.22.1 CROPPING PATTERN: Agriculture being the main occupation of the inhabitants of Tinsukia district is confined to the traditional Kharif cultivation depending on rainfall. Mixed and single cropping is mostly practised in Tinsukia district. Five eighth (63 per cent) of the total households under agriculture follow mixed cropping and rest three eighth (37 per cent) follow single cropping.

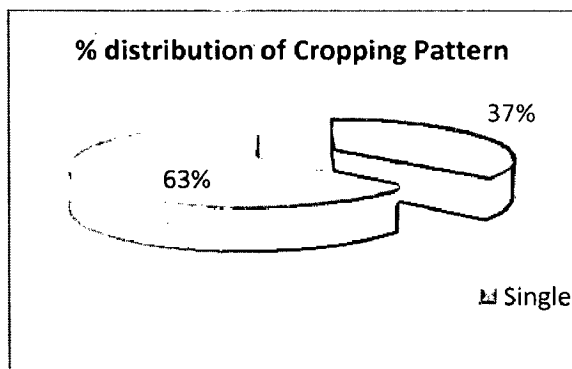


Figure 5.65: Percentage distribution of Cropping Pattern with Income Range

Table 5.34: Cropping Pattern with Income Range

1	2	3				4	
S.No.	Income	Cropping Pattern				Total	
		Single	%	Mixed	%	No.	%
1	0-10000	9	27	13	23	22	24
2	10000-20000	24	73	27	47	51	57
3	20000-30000	0	0	2	4	2	2
4	30000-40000	0	0	7	12	7	8
5	>40000	0	0	8	14	8	9
	TOTAL	33	100	57	100	90	100
	PERCENTAGE	37		63		100	

Source: Primary Household Survey- 2011.

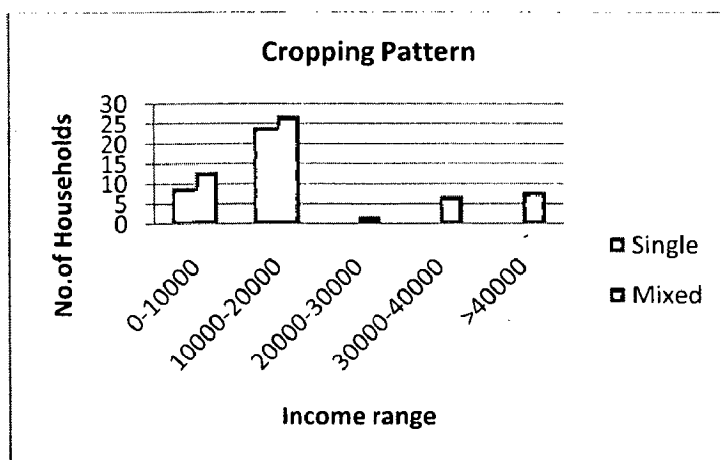


Figure 5.66: Cropping Pattern with Income Range

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5.22.2 LAND OWNERSHIP OF KHARIF CROPS: Below mentioned in the table and figure are the details of Kharif crops produced in the district. The crops produced in the Kharif season here are Rice, Groundnuts, Sugarcane, etc.

Table 5.35: Land ownership of Kharif crops

Table No.43 - Land ownership of Kharif crops (in ha.) (V39 a)											
1	2	3								4	
S.No.	Income	Land ownership of Kharif crops (in ha.)								Total	
		0-10 Ha.	%	10-20 Ha.	%	20-30 Ha.	%	> 30 Ha.	%	No.	%
1	0-10000	26	32	0	0	0	0	2	25	28	28
2	10000-20000	26	32	4	100	6	100	6	75	42	42
3	20000-30000	8	10	0	0	0	0	0	0	8	8
4	30000-40000	8	10	0	0	0	0	0	0	8	8
5	>40000	14	17	0	0	0	0	0	0	14	14
	TOTAL	82	100	4	100	6	100	8	100	100	100

Source: Primary Household Survey- 2011.

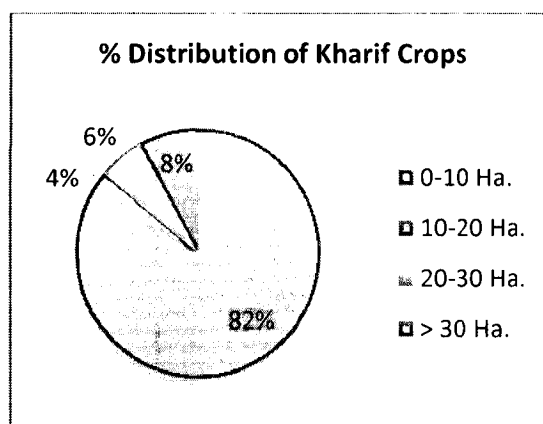


Figure 5.67: Land distribution percentage of Kharif crops

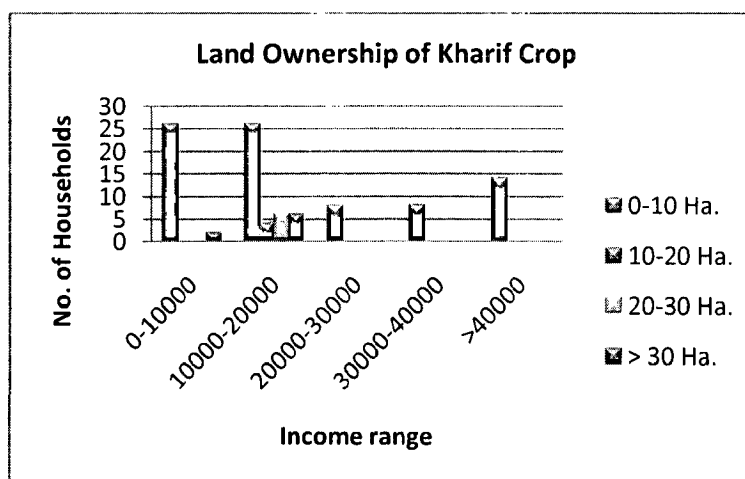


Figure 5.68: Land ownership of Kharif crops

5.22.3 LAND OWNERSHIP OF RABI CROPS: The crops of Rabi season of Tinsukia are Wheat, oilseeds and some pulses. The details of the Rabi crops are mentioned below in table and figure.

Table 5.36: Land ownership of Rabi crops

Table No.44 - Land ownership of Rabi crops (in ha.) (V39 b)											
1	2	3								4	
S.No.	Income	Land ownership of Rabi crops (in ha.)								Total	
		0-2 Ha.	%	2-4 Ha.	%	4-6 Ha.	%	>6 Ha.	%	No.	%
1	0-10000	27	30	1	33	0	0	0	0	28	28
2	10000-20000	34	37	2	67	2	100	4	100	42	42
3	20000-30000	8	9	0	0	0	0	0	0	8	8
4	30000-40000	8	9	0	0	0	0	0	0	8	8
5	>40000	14	15	0	0	0	0	0	0	14	14
	TOTAL	91	100	3	100	2	100	4	100	100	100

Source: Primary Household Survey- 2011.

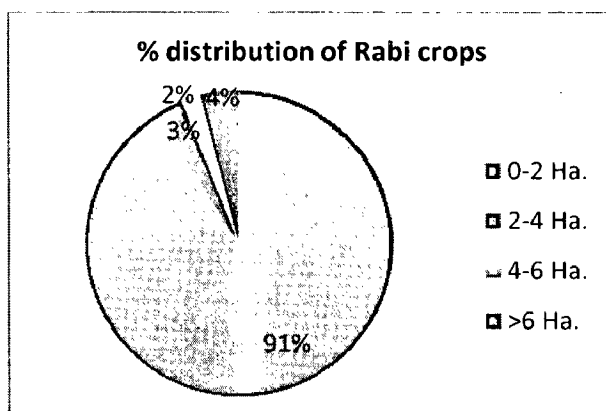


Figure 5.69: Land distribution percentage of Rabi crops

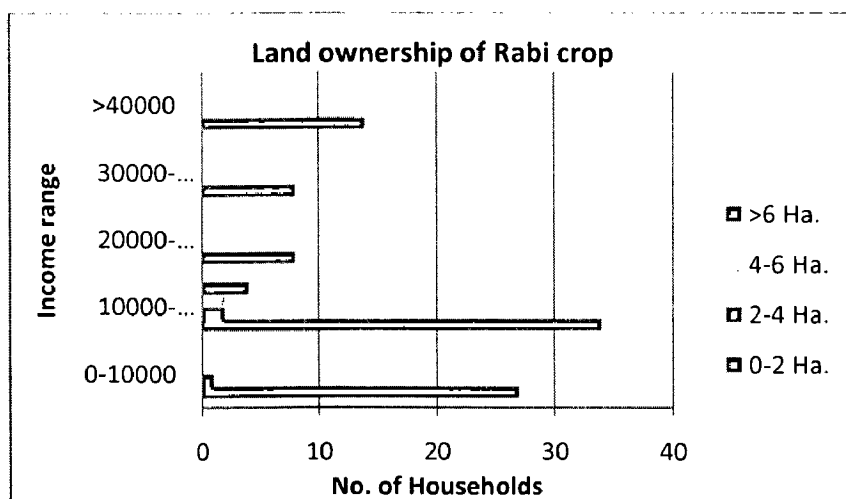


Figure 5.70: Land ownership of Rabi crops

5.22.4 CROP DETAILS – PADDY: In the agrarian system, of the entire paddy produced, only 3 per cent is consumed by the households and remaining is sold as surplus.

Table 5.37: Details of Paddy crop

Table No.46 - Crop details - PADDY (in kg) (V41, 42, 42a A)									
1	2	3						4	
S.No.	Income	PADDY (in kg)						Total	
		Production	%	Consumption	%	Soldout/Surplus	%	No.	%
1	0-10000	65800	13	6200	22	59600	12	131600	13
2	10000-20000	451600	87	22400	78	429200	88	903200	87
3	20000-30000	0	0	0	0	0	0	0	0
4	30000-40000	0	0	0	0	0	0	0	0
5	>40000	0	0	0	0	0	0	0	0
	TOTAL	517400	100	28600	100	488800	100	1034800	100
	PERCENTAGE	50		3		47		100	

Source: Primary Household Survey- 2011.

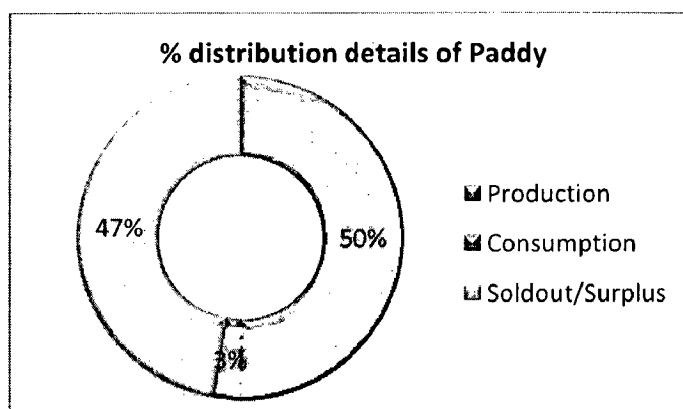


Figure 5.71: Details of Paddy crop

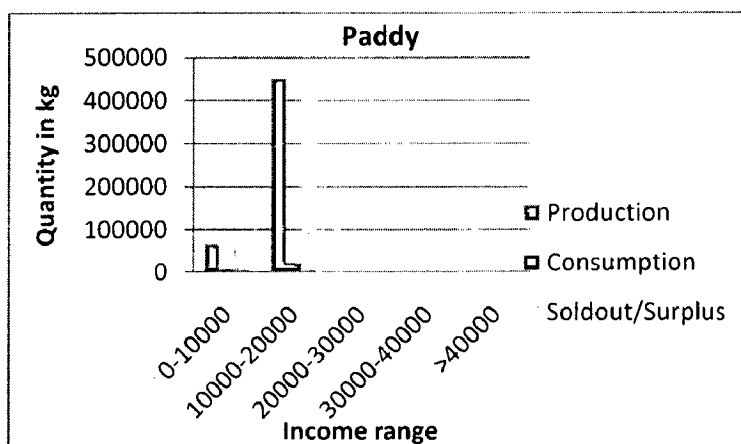


Figure 5.72: Production, Consumption and Surplus of Paddy with Income

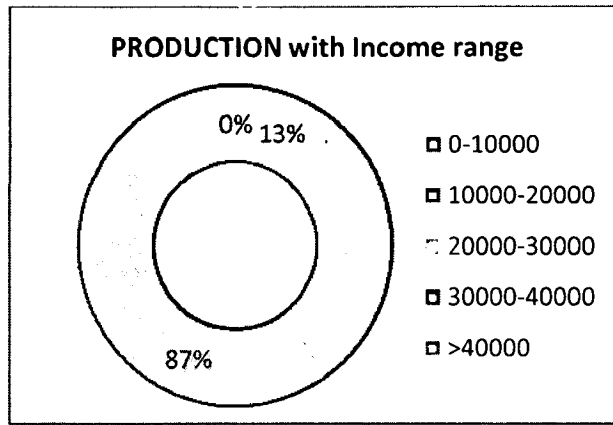


Figure 5.73: Production of Paddy with Income Range

As can be deduced from the chart, only the first two income groups are involved in agricultural activities. The first range produces one tenth (13 per cent) of the total paddy and the remaining nine tenth (87 per cent) is produced by the income range 10,000-20,000.

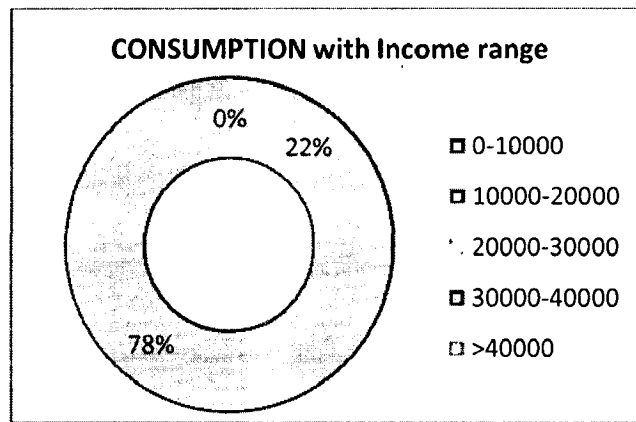


Figure 5.74: Consumption of Paddy with Income Range

Similar is the consumption scenario. Here, seven ninth parts (78 per cent) of the consumption is from the second income group and two ninth (22 per cent) is by the first group.

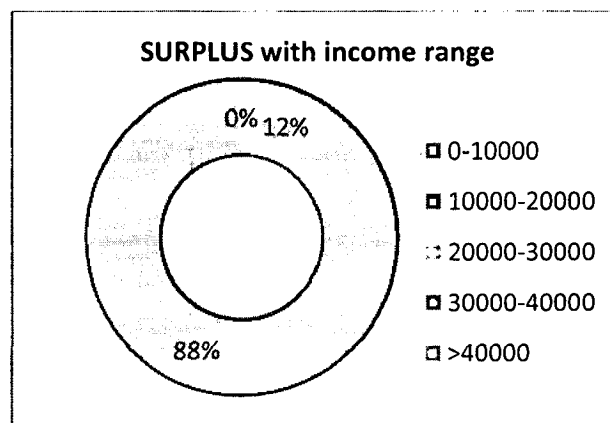


Figure 5.75: Surplus of Paddy with Income Range

5.22.5 CROP DETAILS – OILSEEDS: Oilseeds like Mustard, rapeseed etc. are mostly grown in Tinsukia. The pattern of production, consumption and surplus is similar as that of paddy crop. Of the total produce only 3 per cent is consumed by the households and the rest is sold out in the wholesale market. In this area, four fifth parts (80 per cent) is produced by the farmers of second income group and one fifth (20 per cent) by the first category. The pattern of consumption and surplus is commensurate. The higher income categories do not indulge in farming occupation. The productivity of oilseeds in the study area is 525 kg/hectare.

Table 5.38: Details of Oilseeds

Table No.47 - Crop details -OILSEEDS (in kg) (V41, 42, 42a B)									
1	2	3						4	
S.No.	Income	OILSEEDS (in kg)							
		Production	%	Consumption	%	Soldout/Surplus	%	No.	%
1	0-10000	2720	20	200	22	2520	19	5440	20
2	10000-20000	11163	80	700	78	10463	81	22326	80
3	20000-30000	0	0	0	0	0	0	0	0
4	30000-40000	0	0	0	0	0	0	0	0
5	>40000	0	0	0	0	0	0	0	0
	TOTAL	13883	100	900	100	12983	100	27766	100
	PERCENTAGE	50		3		47		100	

Source: Primary Household Survey- 2011.

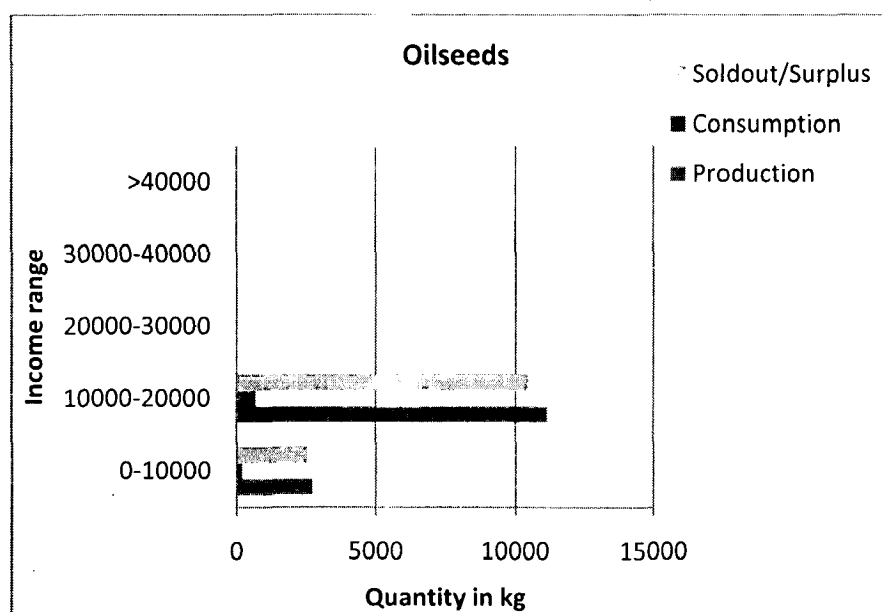


Figure 5.76: Crop details of Oilseeds with Income Range

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5.22.6 CROP DETAILS – WHEAT: The productivity of wheat is 1263 kg/hectare in Tinsukia district. The total production, consumption and surplus that is sold out in the market can be understood from the table and figure mentioned below. In this area, although the productivity of wheat is more than that of paddy, less area is sown under it. With the increase in its area, the production could have been enhanced.

Table 5.39: Details of Wheat

Table No.48 - Crop details -WHEAT (in kg) (V41, 42, 42a B)									
1	2	3						4	
S.No.	Income	WHEAT (in kg)						Total	
		Production	%	Consumption	%	Soldout/Surplus	%	No.	%
1	0-10000	6694	10	600	13	6094	9	13388	10
2	10000-20000	63750	90	4100	87	59650	91	127500	90
3	20000-30000	0	0	0	0	0	0	0	0
4	30000-40000	0	0	0	0	0	0	0	0
5	>40000	0	0	0	0	0	0	0	0
	TOTAL	70444	100	4700	100	65744	100	140888	100
	PERCENTAGE	50		3		47		100	

Source: Primary Household Survey- 2011.

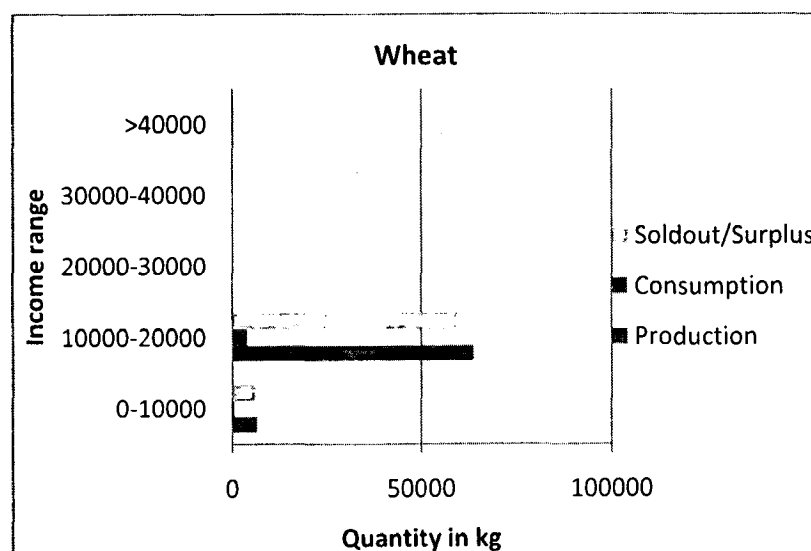


Figure 5.77: Crop details of Wheat with Income Range

5.22.7 CROP DETAILS – VEGETABLES AND CASH CROPS: There are various cash crops like cotton, ginger, tea, turmeric etc. grown in Tinsukia. The vegetables commonly grown are potato, tomato, peas, cauliflower, cabbage etc. There are very limited vegetables that are not grown in this region. The vegetable and cash crop productivity combined is 6926 kg/hectare. In the study area, there are many

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households with large land area who cultivate vegetables in their backyards for self consumption.

Table 5.40: Details of Vegetables and Cash crops

Table No.49 - Crop details -VEGETABLES AND CASH CROPS (in kg) (V41, 42, 42a B)									
1	2	3						4	
S.No.	Income	VEGETABLES AND CASH CROPS (in kg)						Total	
		Production	%	Consumption	%	Soldout/Surplus	%	No.	%
1	0-10000	22648	14	1650	20	20998	13	45296	14
2	10000-20000	144091	86	6450	77	137641	87	288182	86
3	20000-30000	25	0	25	0	0	0	50	0
4	30000-40000	110	0	110	1	0	0	220	0
5	>40000	180	0	180	2	0	0	360	0
	TOTAL	167054	100	8415	100	158639	100	334108	100
	PERCENTAGE	50		3		47		100	

Source: Primary Household Survey- 2011.

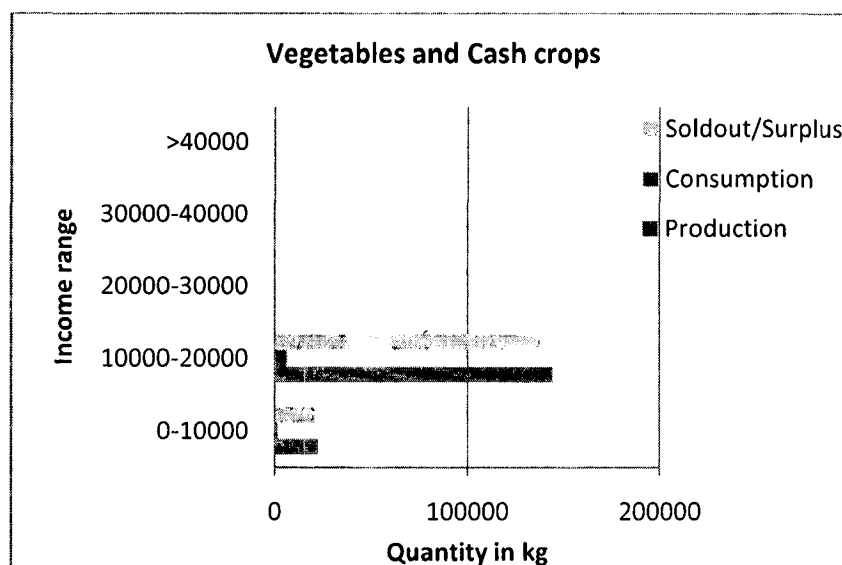


Figure 5.78: Details of Vegetables and Cash crops with Income range

5.22.8 CROP DETAILS – PULSES: As can be observed from below mentioned table and figure, only the second income group of 10,000-20,000 produces pulses. The productivity of pulses is 543 kg/hectare. In the study area the most common pulse grown is peas.

Table 5.41: Details of Pulses

Table No.50 - Crop details -PULSES (in kg) (V41, 42, 42a B)				
1	2	3		4
S.No.	Income	PULSES (in kg)		Total

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		Production	%	Consumption	%	Soldout/Surplus	%	No.	%
1	0-10000	0	0	0	0	0	0	0	0
2	10000-20000	11744	100	1300	100	10444	100	23488	100
3	20000-30000	0	0	0	0	0	0	0	0
4	30000-40000	0	0	0	0	0	0	0	0
5	>40000	0	0	0	0	0	0	0	0
	TOTAL	11744	100	1300	100	10444	100	23488	100
	PERCENTAGE	50		6		44		100	

Source: Primary Household Survey- 2011.

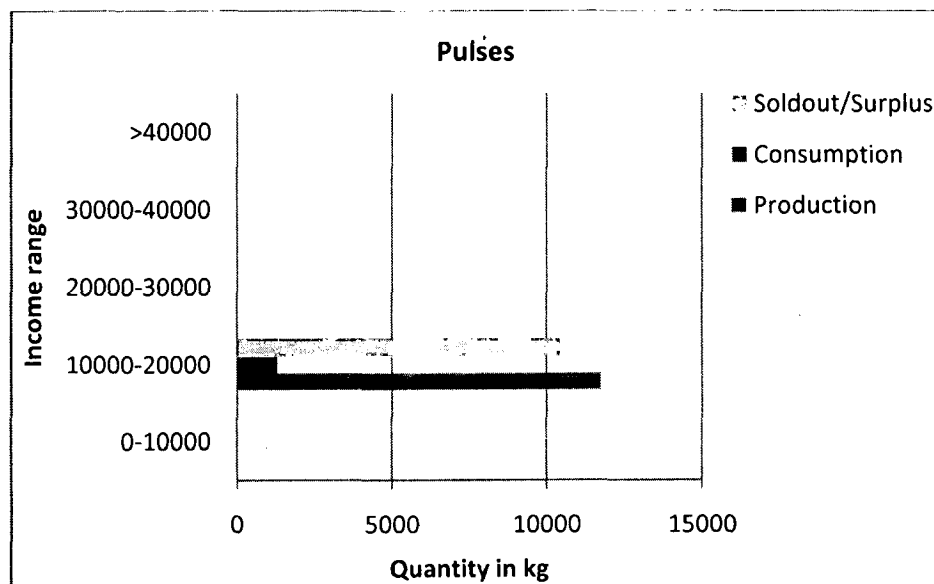


Figure 5.79: Details of Pulses with Income range

5.23 HORTICULTURE: The north-eastern states of India are amongst the prime producer of fruits, flowers and other horticulture items. Tinsukia district also contributes a major share in the whole produce and most of the income earned is based on horticultural products. Therefore, the study of this sector is important and should be considered a major parameter of the dynamics of this region. The revenue incurred by the retailing of horticultural products is enormous and helps to earn foreign exchange. The major products are banana, mango, papaya, guava, peach, jackfruit, amla, pineapple, lemon, bamboo, bettlenut etc.

Table 5.42: HORTICULTURE with Income range

Table No.51 - HORTICULTURE (in kg) (V43, 44, 44a)									
1	2	3						4	
S.No.	Income	HORTICULTURE (in kg)							
		Production	%	Consumption	%	Soldout/Surplus	%	No.	%
1	0-10000	8275	22	415	10	7860	24	16550	22

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2	10000-20000	27350	74	2815	69	24535	74	54700	74
3	20000-30000	270	1	20	0	250	1	540	1
4	30000-40000	776	2	376	9	400	1	1552	2
5	>40000	457	1	457	11	0	0	914	1
	TOTAL	37128	100	4083	100	33045	100	74256	100
	PERCENTAGE	50		5		45		100	

Source: Primary Household Survey- 2011.

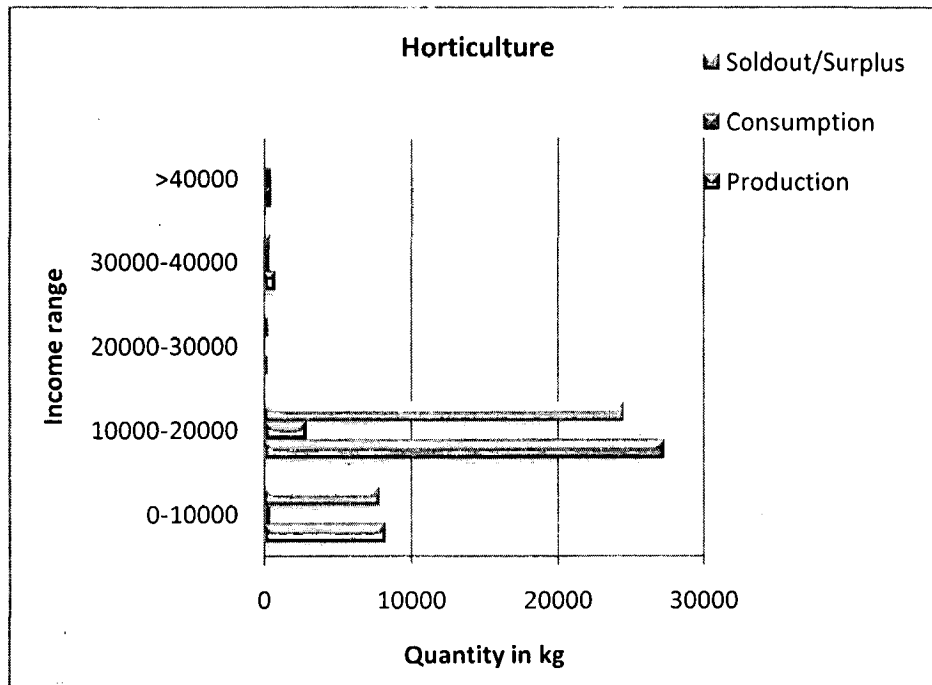


Figure 5.80: HORTICULTURE with Income range

Only 5 per cent of the total horticultural produce is consumed in the system. The first income group of 0-10,000 produces almost about one fifth (22 per cent) of the total. The major three fourth shares (74 per cent) are produced by the second income group. Rest all the other groups cultivate fruits for their self consumption and do not sell it in the market.

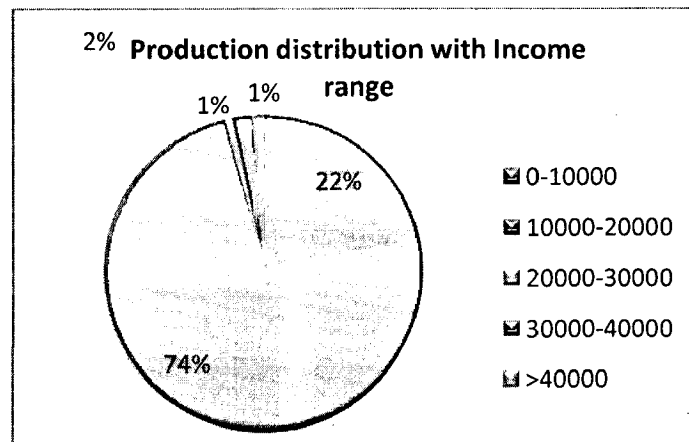


Figure 5.81: Production distribution with Income range

5.24 IRRIGATION OF FARMLANDS: The irrigation system plays a significant role in increasing the agricultural productivity and yield. When the irrigation systems are advanced and improved the production can be enhanced substantially and with improved system the yield also increases. This results in better earning, savings and profit. This profit can again be invested for further production. This rotates the dynamic wheel of economy. The pattern of irrigation has been studied by the investigator and through the analysis attempts have been made to understand the influence of irrigation in agriculture.

Table 5.43: Sources of Irrigation with Income range

Table No.52 - Sources of Irrigation (V45)													
1	2	3										4	
S.No.	Income	Sources of Irrigation										Total	
		Canal	%	Pond	%	River	%	Tubewell	%	Rainfed	%	No.	%
1	0-10000	0	0	0	0	4	22	6	20	18	28	28	25
2	10000-20000	0	0	0	0	14	78	24	80	29	45	67	60
3	20000-30000	0	0	0	0	0	0	0	0	2	3	2	2
4	30000-40000	0	0	0	0	0	0	0	0	7	11	7	6
5	>40000	0	0	0	0	0	0	0	0	8	13	8	7
	TOTAL	0	0	0	0	18	100	30	100	64	100	112	100
	PERCENTAGE	0		0		16		27		57		100	

Source: Primary Household Survey- 2011.

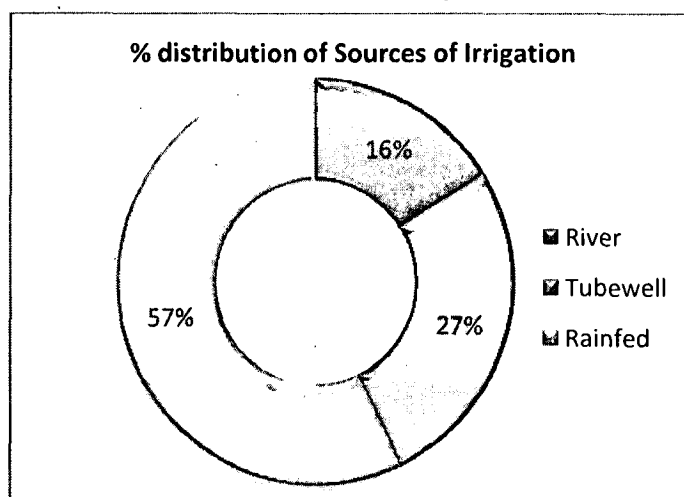


Figure 5.82: Distribution of Sources of Irrigation

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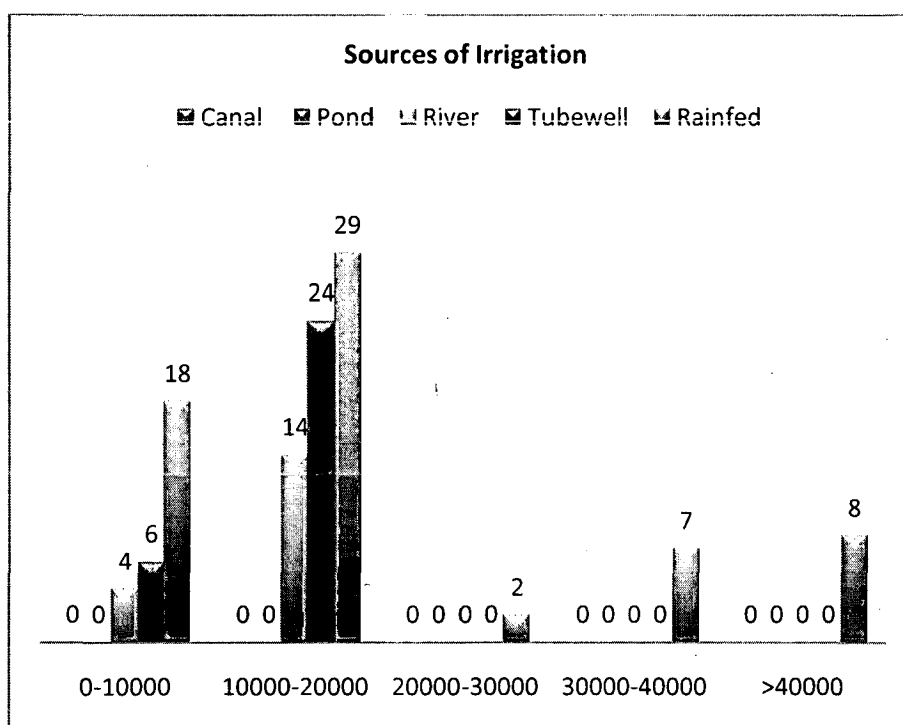


Figure 5.83: Sources of Irrigation with Income range

The irrigation system of the study area is mainly rain fed. A little than three fifth (57 per cent) of the households surveyed depend on the monsoon for irrigation. More than one fourth (27 per cent) households have access to tube wells provided by the administration and also self installed. Only one sixth (16 per cent) have their fields on the river banks and hence use it as a source of irrigation. Out of the 100 samples, no household use canals and ponds for irrigation. They are mostly dependent on natural sources. The yield and produce could be increased by bringing more area under irrigation and observing improved techniques to water farmlands.

5.25 INPUT IN AGRICULTURE:

Table 5.44: Input in agriculture with Income range

Table No.53 - Input in Agriculture (in Rs.) (V46)															
1	2	3												4	
S. No	Income	Input in Agriculture (in Rs.)												Total	
		Fertiliser	%	Ploughing	%	Labour	%	Seeds	%	Irrigation	%	Energy	%	No.	%
1	0-10000	4441 00	1 3	0	0	0	0	486 45	1 2	600	2	143 10	3 2	5076 55	1 3
2	10000- 20000	2989 400	8 7	1052 34	9 8	300 00	8 8	340 965	8 7	2400	8	285 30	6 4	3496 529	8 7

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3	20000-30000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	30000-40000	1400	0	800	1	220	0	134	0	0	0	105	0	2	6790
5	>40000	2950	0	1560	1	196	0	109	0	0	0	900	2	8460	0
			1		1		1		1		1		1		1
	TOTAL	3437	0	1075	0	341	0	392	0	0	0	447	0	4019	0
		850	0	94	0	60	0	040	0	3000	0	90	0	434	0
PERCENTAGE		86		3		1		10		0		1		100	

Source: Primary Household Survey- 2011.

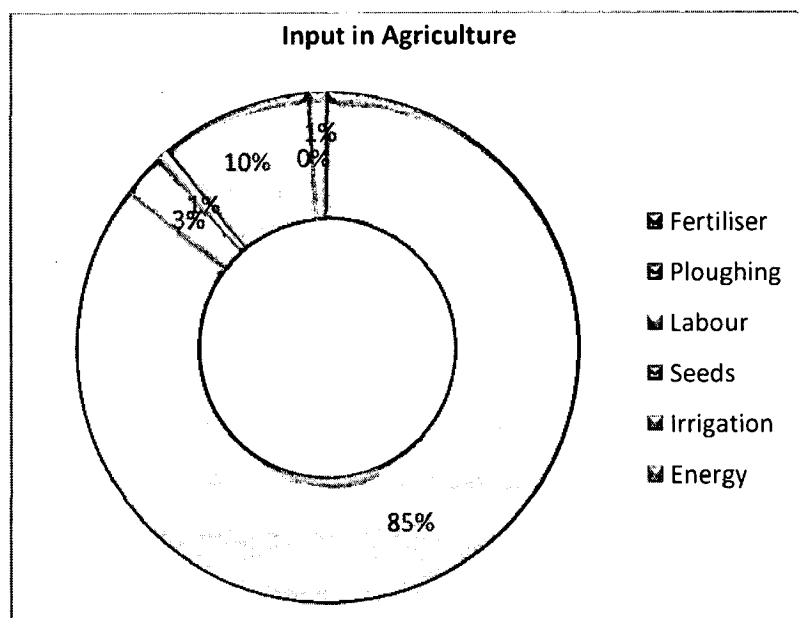


Figure 5.84: % distribution of Input in Agriculture

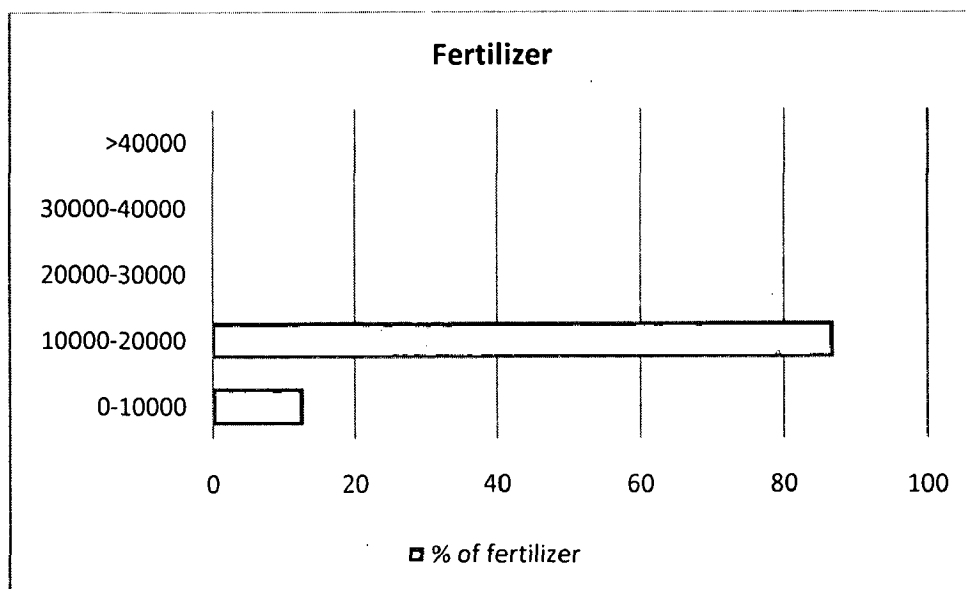


Figure 5.85: % distribution of Input in Fertilizer

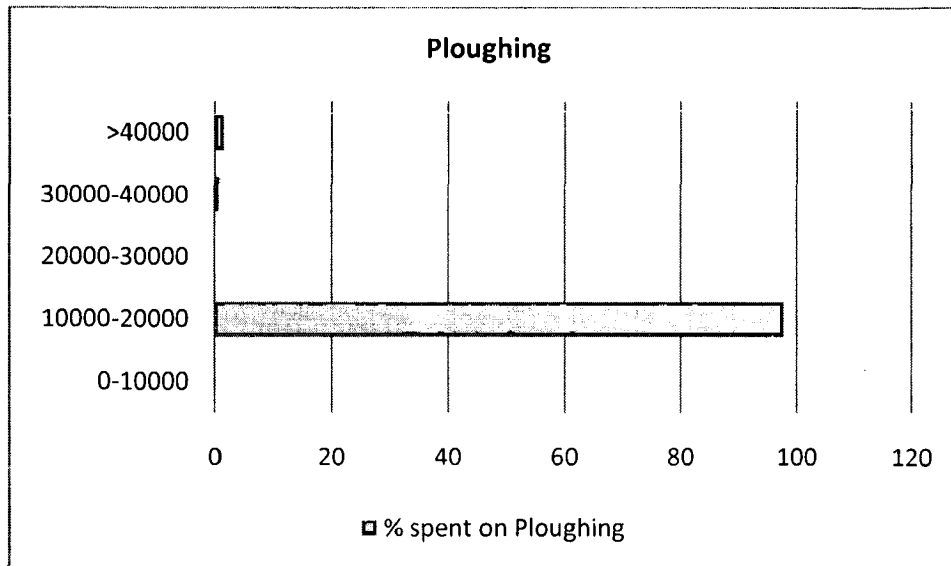


Figure 5.86: % distribution of Input in Ploughing

The households in the second income group spend more on fertilizers. Due to the increased fertilizer use the productivity also increases. As a result of which their income also increases. In case of ploughing, the second income group of 10,000-20,000 indulge 87 per cent. This group has considerable amount of land holding which is ploughed by hiring labours and tractors.

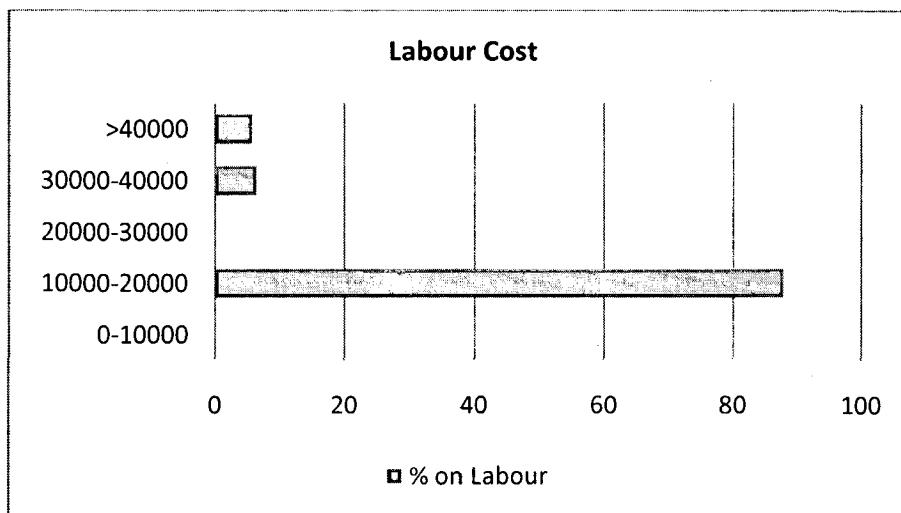


Figure 5.87: % distribution of Input Labour Charges

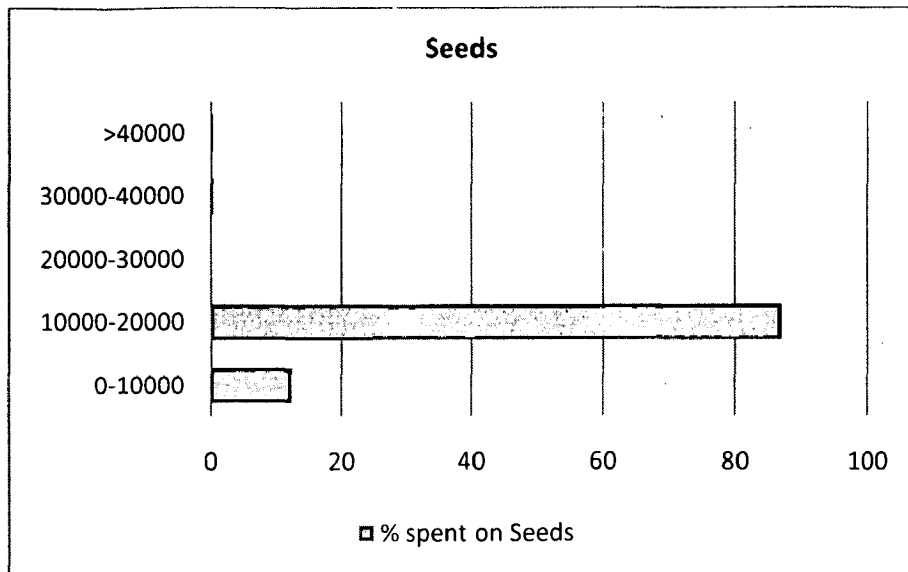


Figure 5.88: % distribution of Input in purchasing Seeds

The input in agriculture in the form of fees of the labourers is greater in the second income group. They spend more than 80 per cent on labour cost. The higher income groups cannot plough or take care of their cultivation all by themselves. Therefore, they hire labours to manage their fields or cultivation. There are government fair price shops available in the system which provides seeds to the farmers at cheaper rates. The second income group spends more than six seventh (87 per cent) of the total on seeds, HYV seeds etc. for increased production. It is therefore evident that with the application of better seeds, fertilizers, ploughing facilities and skilled labour the second income group is able to profit more as compared to the first income group.

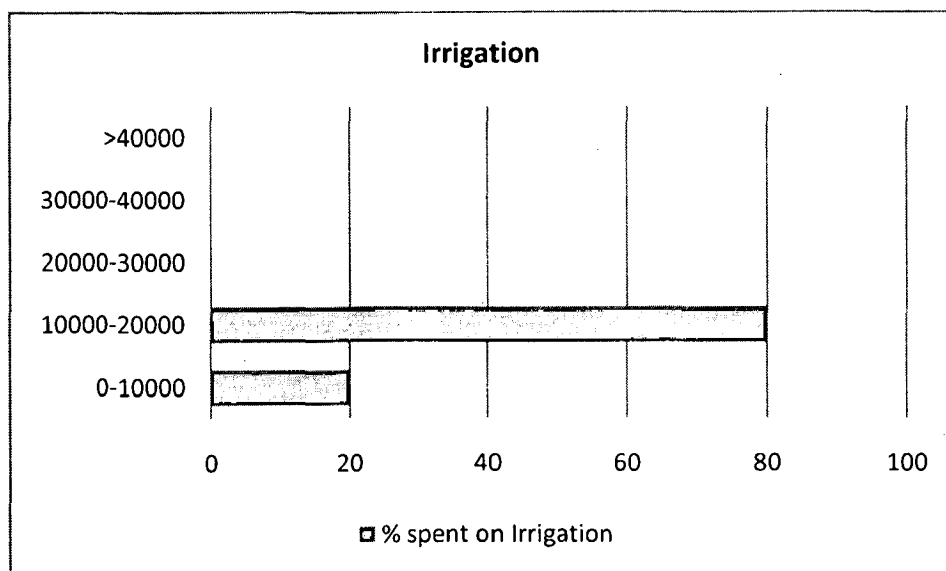


Figure 5.89: % distribution of Input in Irrigation

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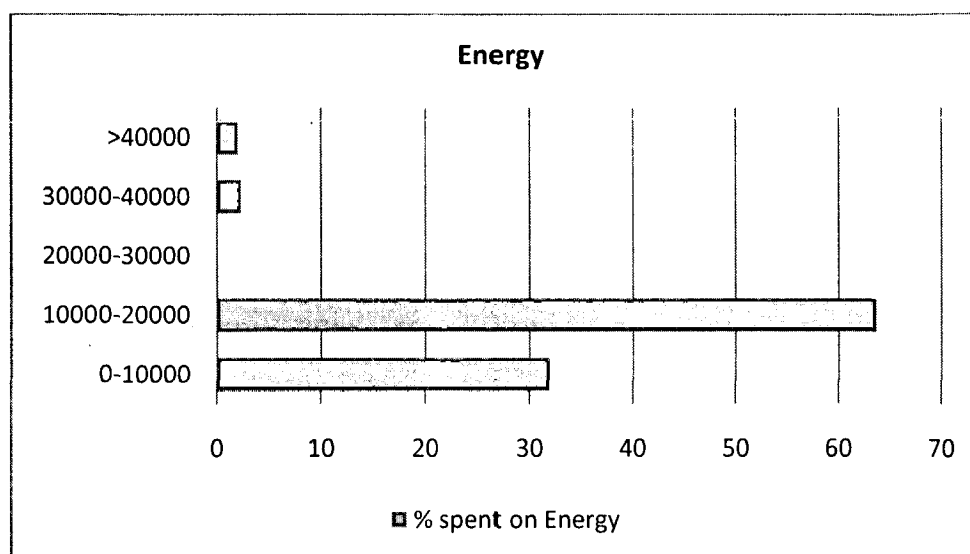


Figure 5.90: % distribution of Input in Energy

Similar observations are made in case of spending on irrigation and energy. More inputs in agriculture lead to more output in the form of high yield. Here, in almost all the income groups, spending on energy is more as compared to that of other disciplines.

5.26 LIVESTOCK: This is one of the important parameters of dynamism of the rural system. This gives a fair perception of the benefits earned from the agricultural allied activities. In the surveyed area, five ninth (55 per cent) of the families have mulching cows, less than one tenth (7 per cent) have buffaloes, one sixth (16 per cent) have bull/ox/mule/horse and more than one fifth (22 per cent) have sheep/goat/pigs. The bovine population is mainly found in the primary sector of the society and these families are involved in allied activities also. Their primary occupation is agriculture and secondary is business.

Table 5.45: Bovine population with income range

Table No.54 - Bovine Population in relation with income (V47 a)											
1	2	3								4	
S.No.	Income	Bovine Population								Total	
		Cow	%	Buffalo	%	Bull/ox/mule/horse	%	Sheep/goat/pig	%	No.	%
1	0-10000	22	22	0	0	5	17	16	38	43	23
2	10000-20000	58	57	14	100	21	72	22	52	115	61
3	20000-30000	16	16	0	0	3	10	0	0	19	10
4	30000-40000	0	0	0	0	0	0	0	0	0	0
5	>40000	6	6	0	0	0	0	4	10	10	5

DYNAMIC FEATURES OF THE STUDY AREA

TOTAL	102	100	14	100	29	100	42	100	187	100
PERCENTAGE	55		7		16		22		100	

Source: Primary Household Survey- 2011.

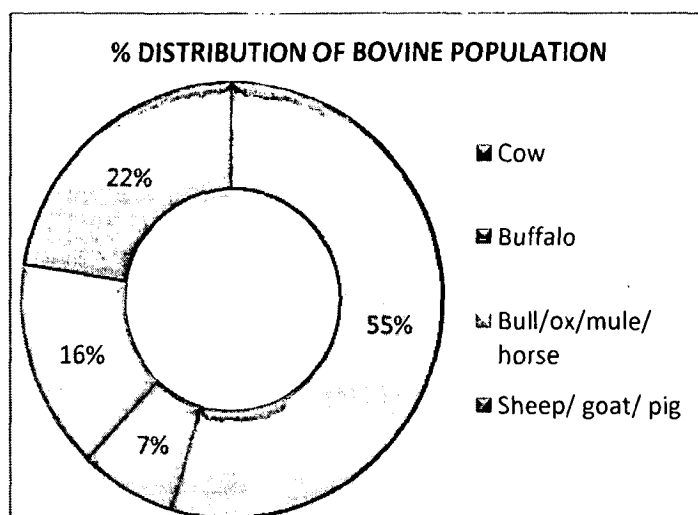


Figure 5.91: Bovine population distribution

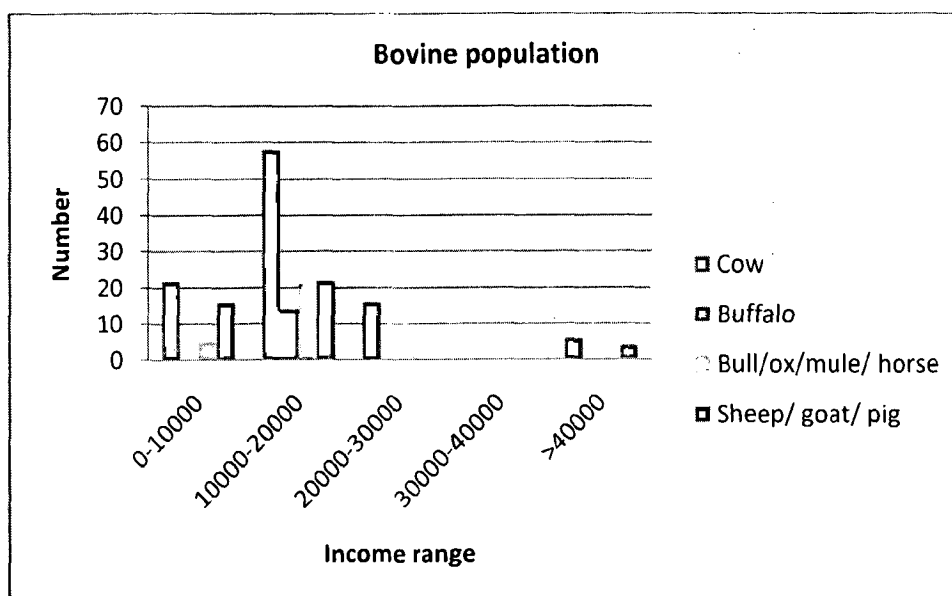


Figure 5.92: Bovine population with income range

5.26.1 MILK PRODUCTION: The total production of milk from the total surveyed area is 1100 litres per day, of which just 75 litres per day is consumed by the households. The milk surplus can be used properly and dairy factories can be put up in the system to commercialize the milk production. In Tinsukia district, the milk supply is done by the milk man directly. There is no facility of district dairy where the daily milk can be packaged and circulated centrally.

DYNAMIC FEATURES OF THE STUDY AREA

Table 5.46: Milk production, consumption and surplus with income range

Table No.56 - Livestock details- MILK (in lts/day) (V48, 49, 49a A)									
1	2	3						4	
S.No.	Income	MILK (in lts/day)						Total	
		Production	%	Consumption	%	Soldout/Surplus	%	No.	%
1	0-10000	220	20	15	20	205	20	440	20
2	10000-20000	700	64	46	61	654	64	1400	64
3	20000-30000	160	15	6	8	154	15	320	15
4	30000-40000	0	0	0	0	0	0	0	0
5	>40000	20	2	8	11	12	1	40	2
	TOTAL	1100	100	75	100	1025	100	2200	100
	PERCENTAGE	50		3		47		100	

Source: Primary Household Survey- 2011

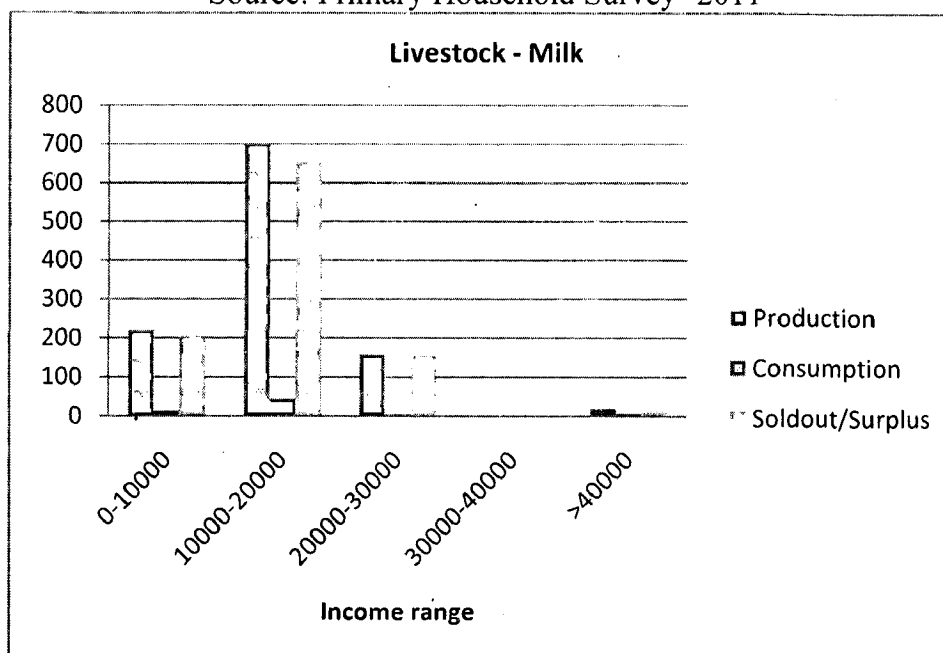


Figure 5.93: Milk production, consumption and surplus with income range

5.26.2 DUNG PRODUCTION: The production of dung from livestock is 715 kilograms per day, of which 425 kgs per day is the recorded surplus (as per survey). Rest is consumed by the households as manures for their fields. This surplus is generally sold by the livestock owners to other households of the urban setup. Although there is provision of biogas plants in the master plan, no effort is yet taken in this regard. If the surplus would have been used as inputs to such plants, the energy consumption could have been reduced.

Table 5.47: Dung production, consumption and surplus with income range

Table No.57 - Livestock details- DUNG (in kgs/day) (V48, 49, 49a B)

DYNAMIC FEATURES OF THE STUDY AREA

1	2	3						4	
S.No.	Income	DUNG (in kgs/day)						Total	
		Production	%	Consumption	%	Soldout/Surplus	%	No.	%
1	0-10000	135	19	40	14	95	22	270	19
2	10000-20000	455	64	215	74	240	56	910	64
3	20000-30000	95	13	5	2	90	21	190	13
4	30000-40000	0	0	0	0	0	0	0	0
5	>40000	30	4	30	10	0	0	60	4
	TOTAL	715	100	290	100	425	100	1430	100
	PERCENTAGE	50		20		30		100	

Source: Primary Household Survey- 2011

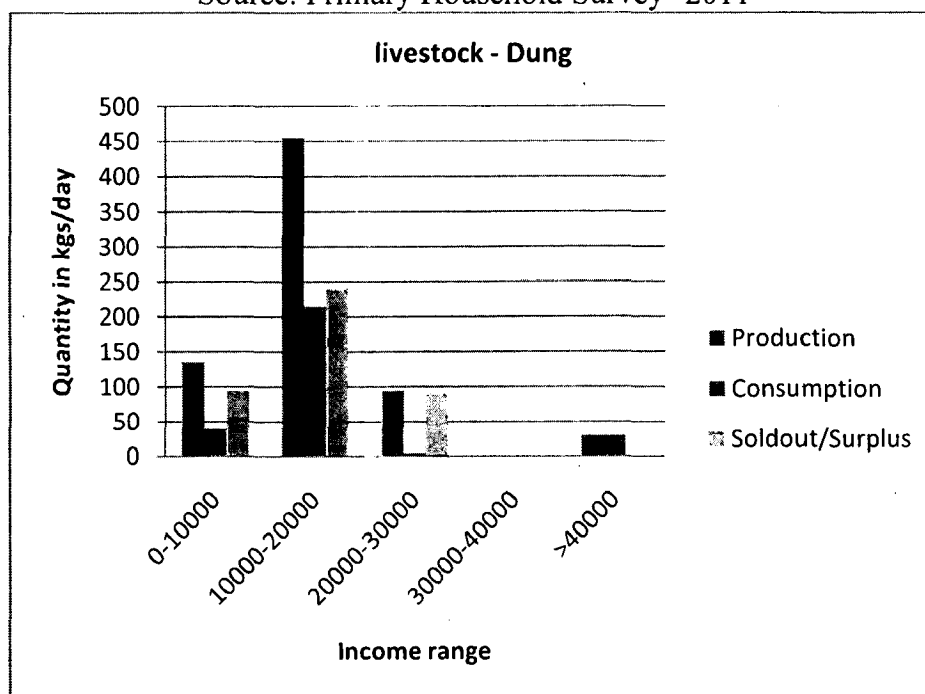


Figure 5.94: Dung production, consumption and surplus with income range

5.26.3 POULTRY AND BIRDS: The second income group is mostly into poultry business and breeding of birds. The people of this region are mostly non – vegetarian and have eggs, meat etc. as their staple food. Poultry business is a lucrative business of north-east region. Here, more than four fifth (84 per cent) of the total earn from poultry and remaining one fifth (16 per cent) earn by rearing ducks, pigeons, swans etc.

Table 5.48: Poultry and Birds population with income range

Table No.55 - Poultry and Birds Population (V47 b)							
1	2	3				4	
S.No.	Income	Poultry and Birds Population				Total	
		Poultry	%	Birds	%	No.	%

DYNAMIC FEATURES OF THE STUDY AREA

1	0-10000	245	44	40	37	285	43
2	10000-20000	276	50	61	57	337	51
3	20000-30000	20	4	0	0	20	3
4	30000-40000	0	0	0	0	0	0
5	>40000	14	3	6	6	20	3
TOTAL		555	100	107	100	662	100
PERCENTAGE		84		16		100	

Source: Primary Household Survey- 2011.

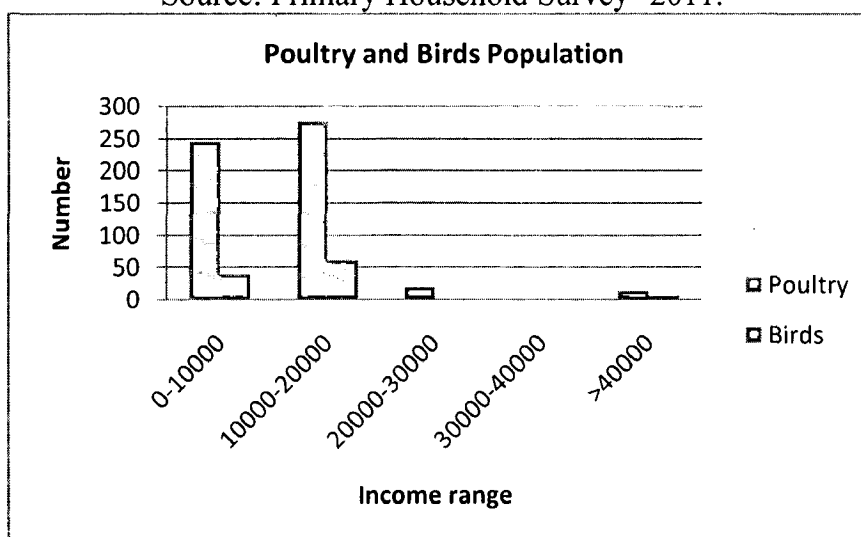


Figure 5.95: Poultry and Birds population with income range

Table No. 5.49: Eggs production, Consumption and surplus with income range

Table No.59 - Livestock details- EGGS (in no.s/year) (V48, 49, 49a D)									
1	2	3						4	
S.No.	Income	EGGS (in no.s/year)						Total	
		Production	%	Consumption	%	Soldout/Surplus	%	No.	%
1	0-10000	12250	45	1800	45	10450	45	24500	45
2	10000-20000	13800	51	1925	48	11875	52	27600	51
3	20000-30000	1000	4	300	7	700	3	2000	4
4	30000-40000	0	0	0	0	0	0	0	0
5	>40000	4	0	4	0	0	0	8	0
	TOTAL	27054	100	4029	100	23025	100	54108	100
	PERCENTAGE	50		7		43		100	

Source: Primary Household Survey- 2011

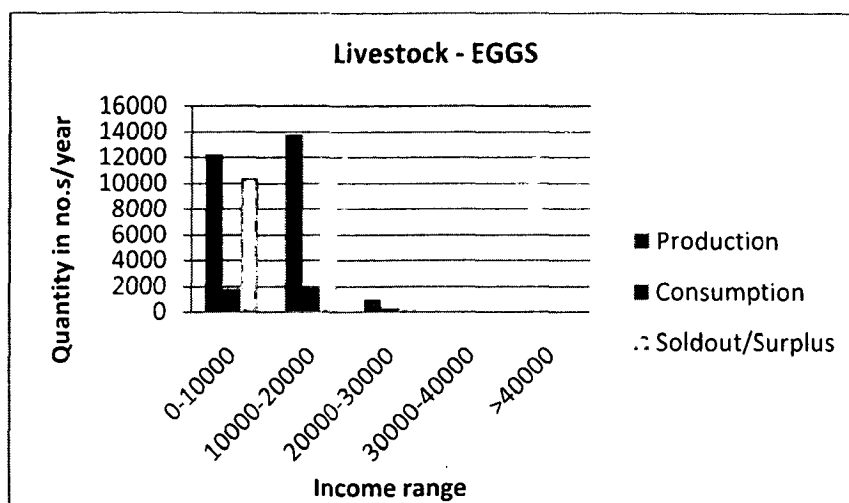


Figure 5.96: Eggs production, Consumption and surplus with income range

Table 5.50: Meat production, Consumption and surplus with income range

Table No.58 - Livestock details- MEAT (in kgs/year) (V48, 49, 49a C)									
1	2	3						4	
S.No.	Income	MEAT (in kgs/year)						Total	
		Production	%	Consumption	%	Soldout/Surplus	%	No.	%
1	0-10000	550	41	220	54	330	35	1100	41
2	10000-20000	766	57	185	46	581	62	1532	57
3	20000-30000	20	1	0	0	20	2	40	1
4	30000-40000	0	0	0	0	0	0	0	0
5	>40000	0	0	0	0	0	0	0	0
	TOTAL	1336	100	405	100	931	100	2672	100
	PERCENTAGE	50		15		35		100	

Source: Primary Household Survey- 2011.

5.27 SERICULTURE: Sericulture, or silk farming, is the rearing of silkworms for the production of raw silk. Today, China and India are the two main producers, together manufacturing more than 60% of the world production each year. Tinsukia district is one of the important centres for production of raw silk in the state of Assam. The village engaged in this activity is Tingrai. Sericulture has become one of the most important cottage industries in Tinsukia district. Just 5 per cent of the land under this activity ranges from 0-2 hectares. More than half (54 per cent) area comes from 2-4 hectare and around two fifth (41 per cent) of the total is spread over 4-6 hectares of land. The detailed land area under sericulture can be understood from the table and figure listed below.

DYNAMIC FEATURES OF THE STUDY AREA

Table 5.51: Land area under Sericulture with income range

Table No.60 - Land area under Sericulture (in Ha.) (V50)									
1	2	3						4	
S.No.	Income	Land area under Sericulture (in Ha.)						Total	
		0-2 Ha.	%	2-4 Ha.	%	4-6 Ha.	%	No.	%
1	0-10000	0	0	0	0	4.37	45	4.37	18
2	10000-20000	1.28	100	13.1	100	5.42	55	19.8	82
3	20000-30000	0	0	0	0	0	0	0	0
4	30000-40000	0	0	0	0	0	0	0	0
5	>40000	0	0	0	0	0	0	0	0
TOTAL		1.28	100	13.1	100	9.79	100	24.17	100
PERCENTAGE		5		54		41		100	

Source: Primary Household Survey- 2011.

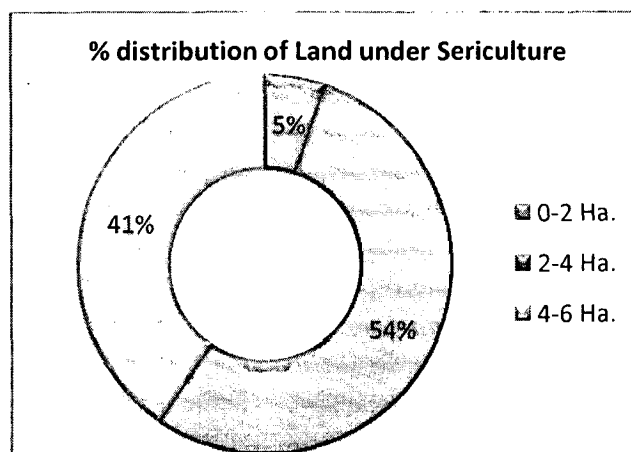


Figure 5.97: Distribution of Land area under SERICULTURE

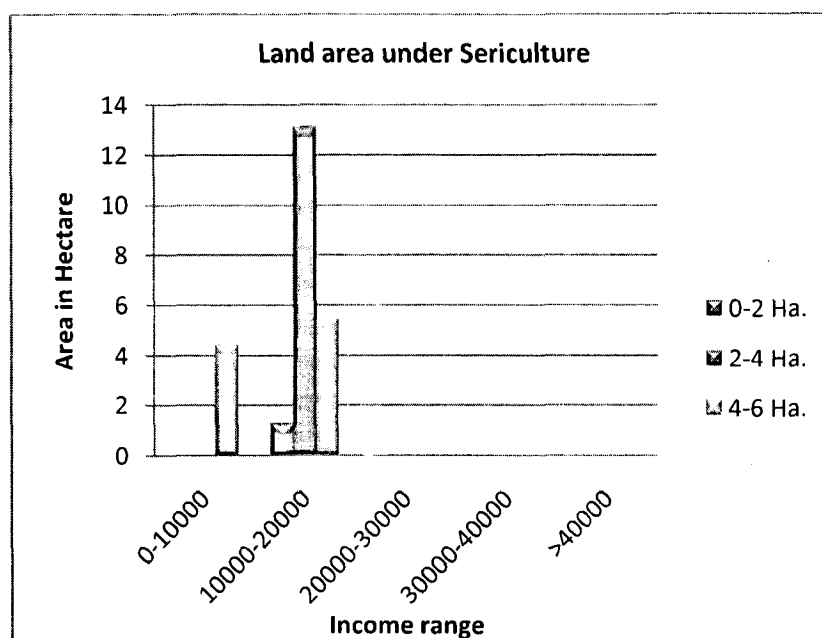


Figure 5.98: Land area under Sericulture with income range

DYNAMIC FEATURES OF THE STUDY AREA

Table No. 5.52: Sericulture with income range

Table No.61 - Sericulture (V50 a)									
1	2	3						4	
S.No.	Income	Sericulture (in kg)						Total	
		Production	%	Consumption	%	Soldout/Surplus	%	No.	%
1	0-10000	114.36	18	4.36	16	110	18	228.72	18
2	10000-20000	518.17	82	23.17	84	495	82	1036.34	82
3	20000-30000	0	0	0	0	0	0	0	0
4	30000-40000	0	0	0	0	0	0	0	0
5	>40000	0	0	0	0	0	0	0	0
	TOTAL	632.53	100	27.53	100	605	100	1265.06	100
	PERCENTAGE	50		2		48		100	

Source: Primary Household Survey- 2011.

The surplus of raw silk is 605 kg per year that is sold to the handloom industries, cottage industries and wholesale markets for further processing. The total land area under sericulture is 24.17 hectares (as per primary data). The production of silk can be increased by increasing the rearing area and by introducing bio technically improved cocoons for better yield.

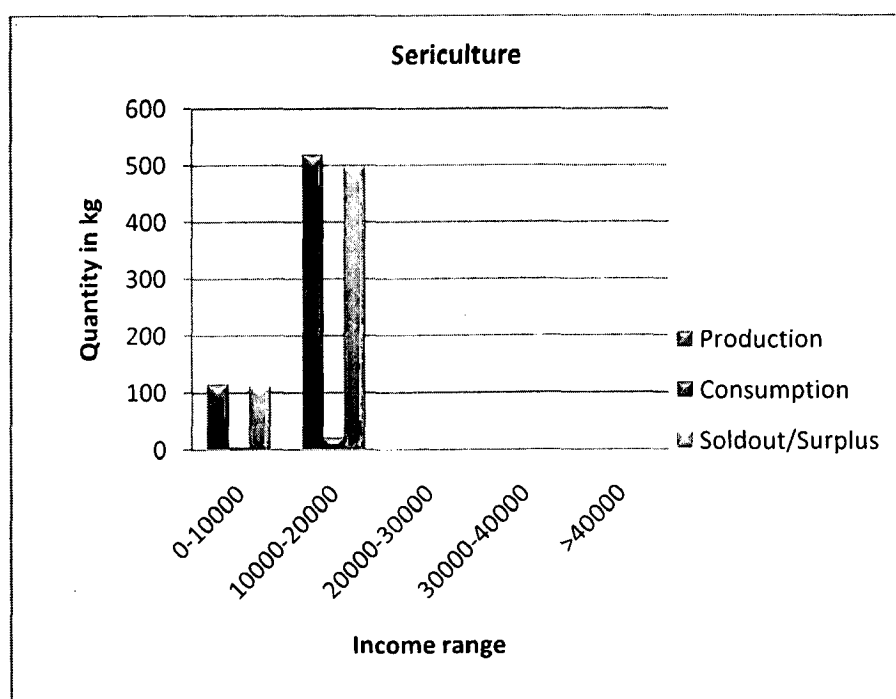


Figure 5.99: Sericulture with income range

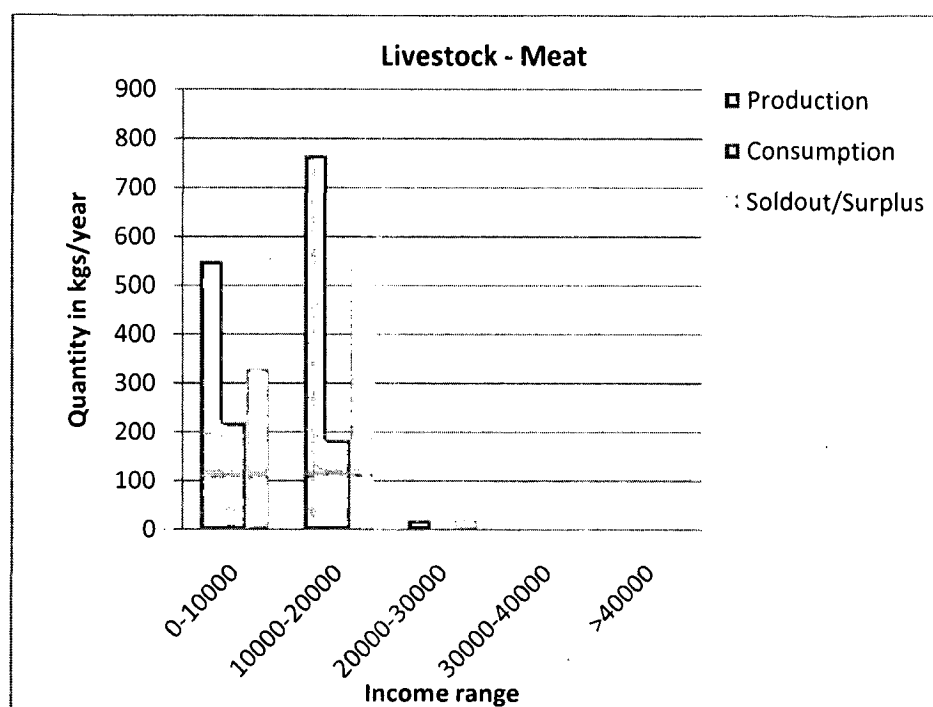


Figure 5.100: Meat production, Consumption and surplus with income range

5.28 FISHERIES: Many villages of Tinsukia are on the banks of river Brahmaputra. In this region the occupation of the people is fishing and raising fisheries. This is one of the lucrative businesses and the revenue generated from this sector is also substantial. This activity is further important because it earns export exchanges from not only other states of the country but also from countries like Myanmar and Bangladesh. Therefore, this is an important parameter of study.

Table 5.53: Fisheries with income range

Table No.62 – Fisheries (V51)									
1	2	3						4	
S.No.	Income	Fisheries (in kg)						Total	
		Production	%	Consumption	%	Soldout/Surplus	%	No.	%
1	0-10000	6500	22	600	22	5900	22	13000	22
2	10000-20000	23100	78	2100	78	21000	78	46200	78
3	20000-30000	0	0	0	0	0	0	0	0
4	30000-40000	0	0	0	0	0	0	0	0
5	>40000	0	0	0	0	0	0	0	0
	TOTAL	29600	100	2700	100	26900	100	59200	100
	PERCENTAGE	50		5		45		100	

Source: Primary Household Survey- 2011.

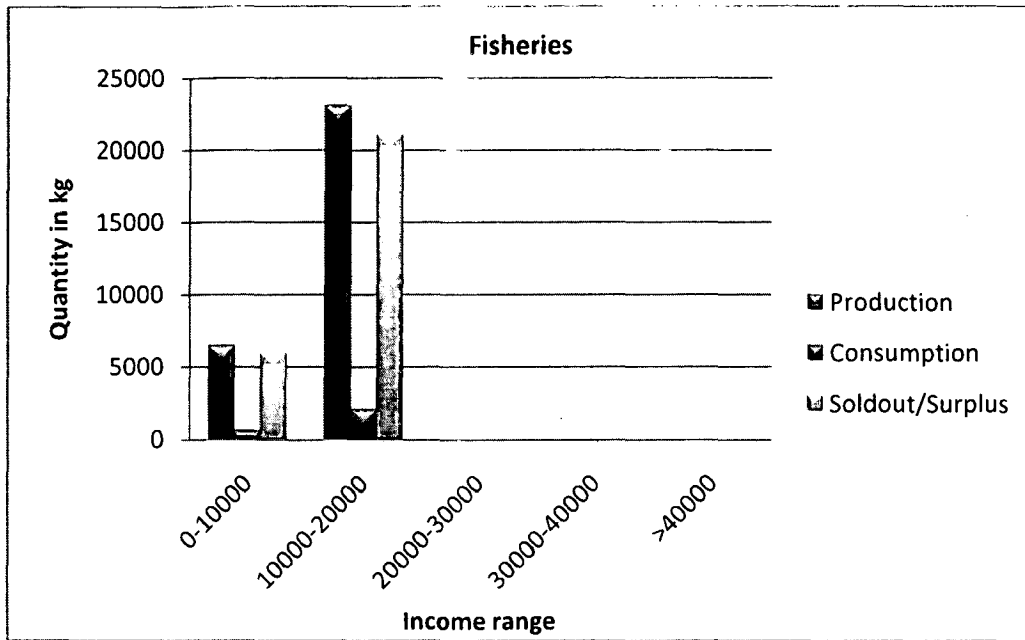


Figure 5.101: Fisheries with income range

The surplus from the fisheries is 26,900 kilogram per year. The first two income groups of 0-10,000 and 10,000-20,000 are mostly engaged in this activity. In most of the flourishing economies, households have their own land for this purpose which is absent in this system.

CHAPTER – 06

**FORECASTING DEMAND AND
SUPPLY OF INFRASTRUCTURE IN
THE SYSTEM**

6.1 INTRODUCTION: In this present investigation, the Investigator has conducted thorough investigation at the grassroots level to understand the functions of the system. The parameters that influence highly in deciding the functions of the system is termed as control parameters. In this chapter, an attempt was made to identify the control parameters that decide the functions of the system by employing correlation techniques. The most important parameters, which decide the functions of the system are considered for analysis and are presented in chapter 5.

The Investigator observes that integrated development of the study area is very much essential for holistic development of the system, and therefore an attempt has been made to develop conceptualized urban system model by considering various subsystems and their controlling parameters obtained from the analysis to evolve plausible policy recommendations for integrated development of the study area (System). Further, the Systems theory and Polarized Regional concept have been employed in this investigation. Projections are done for the year 2031 A.D. by employing suitable statistical techniques. Subsequently, plausible policies are evolved and recommendations are made to have integrated development of the system.

6.2 CORRELATION COEFFICIENT METHOD: In practice, one comes across a large number of problems involving the use of two or more than two variables. If two quantities vary in such a way that movements on one are accompanied by movements on the other, these quantities are correlated. The degree of relationship between the variables under consideration is measured through the correlation analysis. The measure of correlation called the correlation coefficient or correlation index summarizes in one figure the direction and degree of correlation. The correlation analysis refers to the techniques used in measuring the closeness of the relationship between the variables. "Correlation analysis deals with the association between two or more variables".

The Correlation coefficient method is used to analyze the parameters of the various subsystems that highly influence the system. The household data collected for the investigation are utilized for the said purpose, and correlated coefficients between the dependent variable and the independent variables have been established. The parameters, which have higher correlation with the dependent variables, are chosen as the controlling parameters for further analysis. A detailed examination of the data points of the household survey revealed that the monthly income from various occupations in some households is mutually exclusive and others have more than one occupation. Therefore, monthly income of the households is considered as the dependent variables (y) and all other parameters are considered as independent variables (x) for analysis.

The degree of correlation between independent variables and income variables of different subsystems of the system are presented in Table 6.01. This table reveals that monthly savings, expenditure on transport, electricity and monthly expenditure are having high correlation with dependent variable monthly income with Correlation Coefficient 0.9460, 0.9042, 0.8783 and 0.8593 respectively. It has been observed from the table that variable between expenditure on clothes, recreation and health are moderate. Next on list is sewerages system by sewers, dustbins for waste disposal, etc. The expenditure on education (0.6601) is much below on the list and is less compared to other amenities of comfort. Further, it has been observed that some of the variables from Number of Two-Wheelers, expenditure on secondary education are having less correlation with income, with their Correlation Coefficients varies between 0.4227 and 0.2389 respectively. Least in value is the expenditure on fodder, rest of them is having negative correlation with income and can be concluded that they do not have correlation with income at all.

Table no.6.01: Degree of correlation between independent variables and income variables

SL. No.	Variables	Correlation Coefficient
1	Monthly Savings	0.9460
2	Expenditure on Transport	0.9042
3	Expenditure on Electricity	0.8783
4	Monthly Expenditure	0.8593
5	Expenditure on Clothes	0.8533

FORECASTING DEMAND AND SUPPLY OF INFRASTRUCTURE IN THE SYSTEM

6	Expenditure on Recreation	0.7988
7	Expenditure on Health	0.7959
8	Sewerage system by Sewers	0.7799
9	Waste disposal by Dustbins	0.7347
10	No. of Floors	0.7332
11	No. of 4-Wheelers owned	0.7143
12	Other expenditures	0.7085
13	No. of Rooms	0.6678
14	Expenditure on Education	0.6601
15	Expenditure on Petrol	0.6485
16	Expenditure on Loan Repayment	0.6377
17	Expenditure on LPG Pipeline	0.5867
18	Expenditure on Motor Pump	0.5780
19	Expenditure on Food	0.5585
20	Expenditure on Vocational training	0.4993
21	Sewerage system by Septic Tank	0.4250
22	No. of 2-Wheelers owned	0.4227
23	Education - Higher Secondary	0.4188
24	Other Education	0.4104
25	Drainage - Covered	0.3768
26	Waste disposal by Storage Container	0.3317
27	Expenditure on LPG gas	0.2601
28	Education - Secondary	0.2389
29	Expenditure on Diesel	0.1611
30	Water supply by Well	0.0907
31	Expenditure on Fodder	0.0097
32	Water supply by Hand Pump	-0.0425
33	Expenditure on Tractor	-0.0478
34	Age of House	-0.1138
35	No. of Cycles owned	-0.2100
36	Drainage - No Drains	-0.2148
37	Drainage - Open Drains	-0.2378
38	Expenditure on Kerosene	-0.4176
39	Sewerage system by Soak Pit	-0.4250
40	Waste disposal by Burning	-0.5535
41	Expenditure on Fuel wood	-0.6033
42	Waste disposal by Throwing Out	-0.7347

Source: Compiled by the Investigator based on the Primary Household Survey, 2011.

6.3 FORECASTING DEMAND AND SUPPLY OF INFRASTRUCTURE REQUIREMENT FOR THE YEAR 2031 A.D:

This section deals with forecasting of the infrastructure required for the year 2031. At the outset, population is projected for the year 2031 A.D by using suitable statistical methods. Depending on increase in population, extra facilities, which requires are calculated by using suitable planning standards. The real value of the analysis that was done in chapter 5 with a better understanding of past behaviour, one can often make good projections or forecasting for the future. By using the knowledge, one can understand the trend, cyclical and seasonal components of the time series develop forecasts that will provide helpful planning and decision-making information.

Forecasts for one year or less are considered as short term or short-range forecasts. Forecasts of 5 years, 10 years or more are considered as long-term or long-range forecasts. One cannot assure that the trend will continue in the future exactly as it was in the past. If major technological breakthroughs or competitor actions significantly differ from past conditions, then the forecasts may need to be modified. However, if no major changes occur, projections of past trend patterns can prove extremely helpful in forecasting future values of the time series.

The following important control parameters, which decide functions of the system, are considered for projections: They are:

- a) Population
- b) Housing
- c) Drinking water supply
- d) Power
- e) Health and Sanitation
- f) Education
- g) Financial Institutions
- h) Solid waste
- i) Police Station

j) Fire Service Station

k) Agriculture

l) Livestock

6.4 METHODS OF FORECASTING: Forecasting is one of the most important aspects in undertaking planning studies. There are few methods available for forecasting such as, geometric increment method, regression method, arithmetic increment method, incremental increase method, logistic curve method, etc. In this present investigation, population is considered as the focal point. Considering population as focal point, other requirements are calculated by employing relevant standards, which have been set for different variables by different concerned organizations. To project the population availability for the year 2031 A.D, geometric increment method was employed by considering the population increment from 1991 census to 2001 census. The method, which is followed, for population projection for this study is as follows:

6.4.1 POPULATION: Population projections for Tinsukia district have been made by the Investigator by employing Mathematical method, which includes Arithmetic method, Geometric method and the Exponential method. The projections are made for the year 2011, 2021 and 2031 A.D., based on population of the year 1991 and 2001 as per census of India. Different results are observed by employing different projection methods. During the course of investigation, it has been observed that due to the changing growth rate and the exponential growth of population of the district, the Exponential method best suits for the projection of population for the study area.

a.) Arithmetic Method-

$$P_n = P_o + n (P_o - P_m) / m$$

Where, P_n = Projected population for n years

P_o = Present known population

P_m = Population m years earlier than present

n = Number of years hence from now

m = Number of years earlier than present

a.) Arithmetic Method-

$$P_n = P_o + n (P_o - P_m) / m$$

Total population in the year 1991 = 9,62,298

Total population in the year 2001 = 11,50,062

Using Arithmetic Method:

$$P_{2031} = P_{2001} + 30 (P_{2001} - P_{1991}) / 10$$

$$P_{2031} = 11,50,062 + 30 (11,50,062 - 9,62,298) / 10$$

$$P_{2031} = 17,13,354$$

b.) Geometric Method-

$$P_n = P_o (1+r)^n$$

$$\text{and } (1+r) = (P_o/P_m)^{1/m}$$

Where, P_n = Projected population for n years

P_o = Present known population

P_m = Population m years earlier than present

r = Growth rate of population

n = Number of years hence from now

m = Number of years earlier than present

b.) Geometric Method-

Total population in the year 1991 = 9,62,298

Total population in the year 2001 = 11,50,062

Using Geometric Increment Method:

$$P_n = P_o (1+r)^n$$

To find r, $P_{2001} = P_{1991} (1+r)^{10}$

$$11,50,062 = 9,62,298 (1+r)^{10}$$

$$(1+r) = (11,50,062 / 9,62,298)^{1/10}$$

Therefore $r = 1.018 - 1$

$$r = 0.018$$

Therefore population in the projected year 2031 is

$$P_{2031} = P_{2001} (1 + 0.018)^{30}$$
$$= 11,50,062 (1 + 0.018)^{30}$$

$$\mathbf{P_{2031} = 19,64,059}$$

c.) Exponential Method-

$$P_n = P_o \cdot e^{rn}$$

Where, P_n = Projected population for n years

P_o = Present known population

r = Growth rate of population

n = Number of years hence from now

e = exponential (2.72)

c.) Exponential Method-

$$P_n = P_o \cdot e^{rn}$$

To find r, $P_{2001} = P_{1991} \cdot e^{rn}$

$$P_n = 11,50,062$$

$$P_o = 9,62,298$$

$$e = 2.72$$

$$n = 10 \text{ years}$$

$$11,50,062 = 9,62,298 (2.72)^{r \cdot 10}$$

$$1.195 = 2.72^{10r}$$

Taking log on both sides one arrives at

$$\log 1.195 = 10r \log 2.72$$

$$\text{Therefore } r = 0.0774 / 4.345$$

$$\mathbf{r = 0.0178}$$

Therefore population in the projected year 2031 is

$$P_{2031} = P_{2001} \cdot e^{rn}$$

$$P_{2031} = 11,50,062 (2.72)^{0.0178 \times 30}$$

$$P_{2031} = 1963313$$

The population projection for the Tinsukia district by employing various mathematical methods and are presented in Table below.

Table 6.02: Population projection of Tinsukia District

S.No.	Year	Population	Population projection		
			Arithmetic method	Geometric method	Exponential method
1	1991	9,62,298	-	-	-
2	2001	11,50,062	-	-	-
3	2011	-	13,37,826	13,74,672	13,74,278
4	2021	-	15,25,590	16,43,148	16,42,207
5	2031	-	17,13,354	19,64,059	19,63,313

Source: Compiled by the Investigator

It has been observed from the projection that the population of Tinsukia district will be about 17.13 lakh, 19.64 lakh and 19.69 lakh by the year 2031 A.D. by employing Arithmetic method, Geometric method and the Exponential method respectively. Considering the geometric method as best suited for the study area, the projected population of Tinsukia district would be 13.74 lakh, 16.43 lakh and 19.64 lakh in the year 2011, 2021 and 2031 A.D., respectively.

Table 6.03: Details of Population Density in Tinsukia district

S l. N o.	Area (in Sq. km)	Population (in lakh)					Density				
		1991	2001	2011	2021	2031	1991	2001	2011	2021	2031
1	55.32 (Urban)	158674	223957	274934	328630	392812	2868	4048	4970	5941	7101
2	3734.68 (Rural)	803624	926105	1099737	1314519	1571247	215	248	294	352	421
3	3790 (Total)	962298	1150062	1374672	1643148	1964059	254	303	363	434	518

Source: Compiled by the Investigator based on Census of India, 2001

The population density of the district is expected to increase from 303 persons per sq. km in 2001 to 518 persons per sq.km in 2031 and it would be 7,101 persons per sq.km in the urban areas.

6.4.2 HOUSING

Requirement of housing for the year 2031 in the study area is calculated as follows:

$$\begin{aligned} \text{Population to be considered for construction of houses} &= 1964059 - 1150062 \\ &= \mathbf{8,13,997}. \end{aligned}$$

Considering a general family size of 5,

$$\text{Number of houses required} = 8,13,997 / 5 = 1,62,799$$

To this total number of houses, number of kutcha and semi-pucca houses can be added to find out the total number of houses required, since they are not the permanent in nature. As per the Census of India, 2001 the liveable and dilapidated condition of census houses accounts for 17,274 and 1,251 respectively.

$$\begin{aligned} \text{Therefore, the total number of houses required} &= 162799 + 17274 + 1251 \\ &= \mathbf{1,81,324} \end{aligned}$$

6.4.3 DRINKING WATER SUPPLY

Drinking water supply is one of the most important parameters, which needs adequate attention nowadays, since ecological imbalances and environmental crisis are very much phenomenal in our country. Though these problems are very much aggravated mostly in the urban system, it has been started to penetrate in the rural system too. The Central Public Health and Environmental Engineering Organization (CPHEEO), created in 1953, is the technical wing of the Ministry of Urban Development (MoUD), Government of India plays central role in setting design standards and norm setting for urban water supply and sanitation. In India piped water systems, mostly designed according to standards set by the Bureau of Indian Standards (BIS) and the per capita norms set by the BIS are as follows:

- metro cities with sewerage system : 150 lpcd;
- towns and cities with sewerage system: **135 lpcd;**
- towns and cities without sewerage system: 70 lpcd
- population covered by public standpipes: **40 lpcd**

In the investigation 135 lpcd has been considered for per bovine urban population

$$\begin{aligned}\text{Quantity of water required for Urban Population} &= 135 * 392812 \\ &= 53029620 \text{ litres} \\ &= \mathbf{53.02962 \text{ MLD}}\end{aligned}$$

For the **Rural Masses**, to calculate the demand of the quantity of drinking water, the ministry of Rural Development, Government of India's norms have been followed: They are:

- ❖ There are 40 litres of safe drinking water per capita per day (lpcd) for human beings.
- ❖ There are 30 lpcd additionally for cattle in the Desert prone areas.
- ❖ One hand pump or stand post for every 250 persons.
- ❖ The water source should exist within the habitation within a distance of 1.60 km in plains and within 100 meters elevation difference in the hills.
- ❖ Drinking water is defined as safe if it is free from biological contamination and chemical contamination.

In the investigation the same 40 lpcd for man has been considered for per bovine population.

$$\begin{aligned}\text{Quantity of drinking water required for population} &= 40 * 1571247 \\ &= 62849880 \text{ litres} \\ &= \mathbf{62.850 \text{ MLD.}}\end{aligned}$$

$$\begin{aligned}\text{Quantity of water required for livestock} &= 40 * 1139331 \\ &= 45573240 \text{ litres} \\ &= \mathbf{45.57324 \text{ ML.}}\end{aligned}$$

$$\begin{aligned}\text{Total quantity of water required} &= (53.02962 + 62.850 + 45.57324) \\ &= \mathbf{161.452 \text{ ML}}\end{aligned}$$

and

$$\begin{aligned}\text{The total number of hand pumps required in the study area} &= 1571247 / 250 \\ &= \mathbf{6,285}\end{aligned}$$

In addition to the above quantity, water requirement for various non residential purposes, such as Hospital, Hotels, Hostels, Nursing homes, boarding schools / colleges, restaurants, Airport & Seaports, Railways & bus terminals stations, Day schools/ colleges, Offices, Factories, cinema, concrete halls and theatres. Industrial unit's sewerage and drainage systems etc. have to be considered for their better functioning in the study area. The investigator assumed that 25 per cent of total quantity of water requirement for the masses has been considered to cater the needs of these non-residential purposes.

Therefore overall quantity of water requirement for better survival and functioning of the study area are as follows:

$$= 161.452 + 25\% \text{ of the total quantity of water required}$$

$$= 161.452 + 40.363 = \mathbf{201.82 \text{ ML}}$$

6.4.4 HEALTH AND SANITATION

As per the Urban Development Plans Formulation and Implementation guidelines, 1996, and the standards of Government of India the following health facilities are required:

- General hospital - for 2.50 lakh population with capacity of 500 beds.
- Community Health Centre – for a population of 80,000 to 120 lakh
- Primary Health Centre – for a population of 30,000 in plains and 20,000 in tribal and difficult terrain areas.
- Sub-Centre – for a population of 5,000 in plains and 3,000 in hilly and tribal areas.

The total population by the year 2031 = 19,64,059 in the study area.

Number of **General Hospital** required = $19,64,059 / 250000 = 7.85 \sim 8$

(1 Hospital exists in the study area)

Number of **Community Health Centres** required = $19,64,059 / 120000 = 16$

Number of **Primary Health Centres** required = $19,64,059 / 30000 = 65$

Number of **Sub-centres** required = $19,64,059 / 5000 = 393$.

Number of hospital beds available at present are 318.

The number of hospital beds required by the year 2031 = 4000

(As per the norms and standards given in the UDPFI guidelines, 1996 by the Ministry of Urban Affairs & Employment, Government of India)

Therefore number of **hospital beds required** = $4000 - 318 = 3682$ **Hospital beds**.

The health facilities required to be provided by 2031 considering the existing facilities are as follows:

- a. Number of **Community Health Centres** required = $16-4 = 12$
- b. Number of **Primary Health Centres** required = $65 -19 = 46$
- c. Number of **Sub-centres** required = $393 -164 = 229$.
- d. Number of **Hospital beds** required = **3682**.

6.4.5 POWER

As per the norms and standards given in the UDPFI guidelines, 1996, by the Ministry of Urban Affairs & Employment, Government of India, based on the estimated requirements of power supply for Master plan of Delhi, the consumption works out to be about 2 KW per household at the city level and includes domestic, commercial, industrial and other requirements.

Therefore, the power requirement of projected year 2031 A.D has been estimated as follows

The total population by the year 2031 = 19,64,059

As per the census of India, 2001, a general household size = 5.

Total number of households by the year 2031 = $19,64,059 / 5$
= 3,92,812

Therefore, Total power required by the year 2031 would be = $3,92,812 \times 2$ KW

= 7,85,624 KW = **785.624 MW**

6.4.6 EDUCATION

Education is one of the most important parameters, which decides the functions of the system. Education plays a vital role in the economic, social and cultural development of a country. Besides moulding character and values of the citizen, the overall growth of the country depends on educational growth. Education is the basic prerequisite to build a just, equitable society and a tool for the development of the individual and the nation. As per Census, 2001, the literacy rate of Tinsukia district is 63.28%. As per the norms and standards given in the UDPFI guidelines, 1996, by the Ministry of Urban Affairs & Employment, Government of India, and Investigator analyzed the status of existing educational facilities; the same has also been forecasted for the projected year 2031 A.D. and are presented in the Table below.

Table 6.04: Education Facilities in Tinsukia District

Sl.No.	Description	Norms & Standards as per UDPFI guidelines	Facilities required for 2031 wrt population (Nos)	Facilities provided, 2007-08 (Nos)	Facilities required for 2031 excluding existing (Nos)
I	Pre-primary to Secondary Education				
	Pre-primary Schools	1 for 2500	786	0	786
	Primary Schools (Class I to V)	1 for 5000	393	843	Sufficient
	Senior secondary schools(VI to XII)	1 for 7500	262	186	76
II	Higher Education- General				
	College	1 for 1.25 lakh population	16	10	6
	University	1	1	0	1
	Technical Education center	One such center for every 10 lakh population (1 ITI and 1 polytechnic)	2	1	1
III	Professional Education				
	Engineering College	New Engineering Colleges 2 Nos	2	0	2
	Medical College	2 sites	2	0	2

Source: Compiled by the Investigator based on the norms of UDPFI guide lines, 1996

6.4.7 MUNICIPAL SOLID WASTE

Solid wastes generation consists of household waste, industrial/ commercial wastes, construction debris, and biomedical/hospital wastes, and these wastes are not properly disposed; as a consequence, the quality of the environment is degraded. Most of the solid waste is dumped in open grounds. The waste generation capacity of the district is 0.59 Kg per capita per day, which comprises of 65 per cent of biodegradable waste, and the rest (35 per cent) are non-biodegradable waste. These wastes have the composition of yard waste, paper waste, plastic waste, and other wastes, and their corresponding values are 38.40, 30.00, 10.40, and 21.20 per cent respectively.

$$\begin{aligned} \text{Quantity of waste projected for the year 2031} &= 19,64,059 \times 0.59 \\ &= 1158794.81\text{Kg} \\ &= \mathbf{1158.794 \text{ tons per day}} \end{aligned}$$

6.4.8 POLICE

The mission of the Upper Assam police is to uphold the rule of law without fear or favour and to provide safety and security to the people without violating their Human Rights. This district is the most instable and insecure district of Assam as due to the growing influences of the ULFA militants. The law and order in the district is maintained both by police and the army.

As per the norms and standards given in the UDPFI guidelines, 1996 by the Ministry of Urban Affairs & Employment, Government of India, the requirement of Police Station and Police post are as follows:

Number of Police Station required by the year 2031 (1 for 90000 population)

$$= 19,64,059 / 90,000$$

$$= \mathbf{22}$$

Number of existing police stations in the study area = 17

Number of Police post required by the year 2031 (1 for 50000 population)

$$= 19,64,059 / 50,000 = \mathbf{39}$$

Number of existing police post in the study area = 9

In addition to the above 1 Government railway police station and 1 river police station is available in the study area.

6.4.9 AGRICULTURE

Assuming the food requirement of 300 kg, a person a year,

Total food grains required for the population = $300 * 19,64,059$

= 58,92,17,700 kg per year

6.4.10 LIVESTOCK

By considering an amount of 250 ml of milk per capita for a healthy family,

The quantity of milk required would be = $0.25 * 19,64,059$

= 4,91,015 litres per day

= $4,91,015 * 365$ litres per year

= 1,79,22,04,475 litres per year.

= **1792.2 ML/year.**

6.5 CONCLUSION

The investigator identified the most important control parameters which decide the functions of the system and projections are made for the year 2031 A.D, for the demand and supply of infrastructure requirement, based on the population growth.

CHAPTER – 07

**APPLICATION OF CONCEPTS
AND THEORIES**

7.1 INTRODUCTION: In this present investigation, the investigator has conducted a thorough investigation at the grassroots level to understand the functions of the system. The parameters that influence highly in deciding the functions of the system are termed as control parameters. System's concept and Polarized regional concept are employed in this investigation to integrate most important control parameters of various subsystems of the system to achieve integrated development in the system. Attempts has been made to develop a conceptualized urban system model, and established the functions through diagram and are presented in the sequel.

7.1.1 INTEGRATED DEVELOPMENT PLAN: Development plan is a systematically and scientifically evolved work schedule to achieve the specific objectives within the specific period of time by employing the specific amount of resources. Integrated development aims at total development comprising all aspects of development, which include physical, social, economic, ecology, environment, infrastructure, institution, and so on. A workable Integrated Urban Development Plan relies upon the combined application of the following techniques, such as, Information system, Statistics, Operations Research, System Dynamics, and Socio-Econometrics. Conventionally, most of the Scholars employ statistics and few location based techniques to prepare the Master Plan (development plan) and wind up. These plans never yield the desired objectives of the plan rather it creates schism and unrest in the system. These kinds of plans never minimized the problems that exist in the system rather it aggravates the problems in the system.

7.1.2 SYSTEM: A system functions as whole with the interaction of several sub-systems. All the subsystems of the system are interlinked and interdependent to each other, and forming a system. If one of the subsystems defunct, or partly functions or functions with higher degree (taking a lead role) during its function, its effects can be visualized in the entire system over a period of time. Sometimes, the system may not function at all in some cases, while in some cases the system may function, but with lot of disturbances or the smooth functioning of the system may be paralyzed.

7.2 URBAN SYSTEM CONCEPT: The following sub-systems are linked together and form an urban system. They are physical, social, economic, ecology, environment, infrastructure, and institutions. All these subsystems are interlinked and interdependent

to each other functioning as a whole. Urban system is purely a dynamic system since it is always functioning. "A system functions as a whole with the interaction of several sub system. All the subsystems of the systems are inter-linked and inter dependent on each other. If one of the sub systems of the system defunct its effect can be seen in the whole system. Similarly, if one of the subsystems takes a lead role or has advanced functions in the system, its effects can also be observed in the whole system". In this present investigation the whole region is considered as system, since it has several subsystems and all the sub-systems are interlinked and interdependent to each other, and function as a whole. Urban system has different subsystems, such as, physical, social, economic, ecology, environment, infrastructure, and institutions. These all subsystems are interlinked and interdependent on each other and functions as a whole.

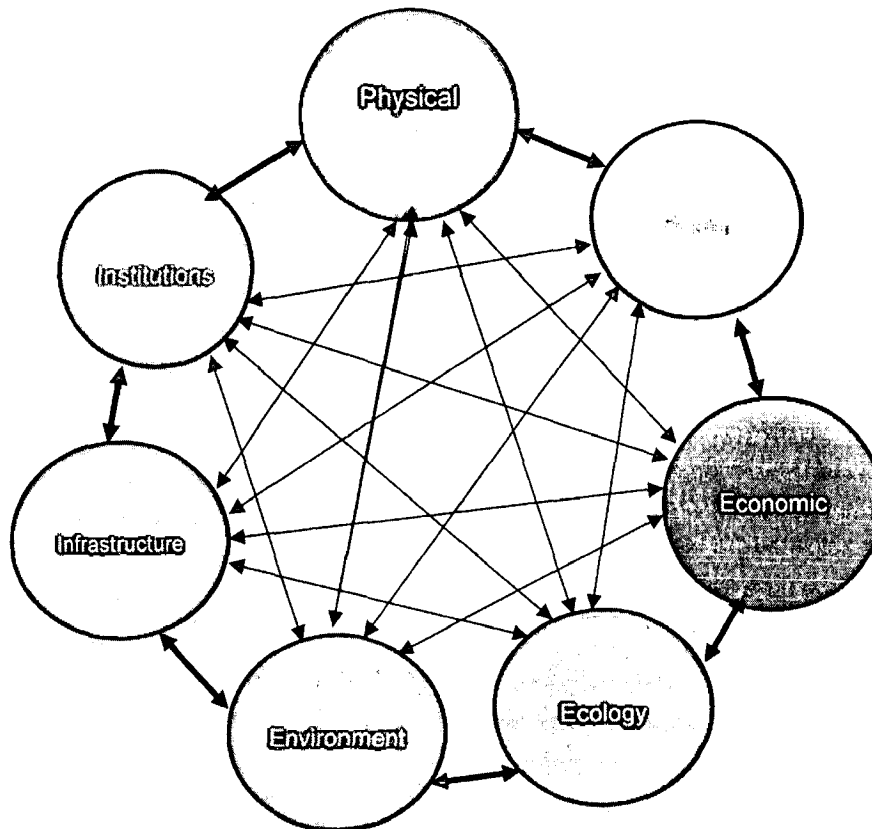


Figure 7.01: Functions of Urban system along with its subsystems

In an urban system, the following sub-systems are interlinked together and form an urban system. They are:

1. Physical

2. Social
3. Economic
4. Ecology
5. Environment
6. Infrastructure, and
7. Institutions.

The functions of the urban system along with its various sub systems and are presented in Figure 7.01. This figure reveals that the all the sub-systems are interlinked and interdependent to each other, forming a system and function as a whole. The functions of the system along with all the subsystems can be quantified, but because of the shortage of time in Master's Thesis, the Investigator conceptualized the urban system model, and establishes its function through diagram no.7.01.

7.2.1 POPULATION FUNCTION: The population function is the one of the subsystem of the urban system. If population increases at an exorbitant rate, its effects can be visualized in the entire system. Population growth will have adverse effects and upset the ecosystem of the city. The excessive rate of consumption of the natural and artificial resources will affect the Physical and Environmental subsystem. The accumulation or concentration of people at one place will result in to social transformation on one hand, and this will create new economic activities on the other. All the subsystems of the system are functioning based on population.

7.3 INTERRELATION OF SUBSYSTEMS: The interrelation and interaction of all the subsystems has been discussed below in the sequel.

7.3.1 PHYSICAL SUBSYSTEM: Physical subsystem consists of the land, topography, availability of water resources, vegetation, minerals and climatic conditions. The growth of any settlement can be controlled by these factors on one hand, and the physical subsystem consists of the danger of flood, heavy rainfall and non-stop showers, storms, the possibility of natural disasters such as

earthquakes and hurricanes. These are the factors which are highly influence the people and also determining factors in deciding whether to settle or move to different sites. The study area is spread on both the banks of river Brahmaputra and is different from any other compact district of India.

In olden days, many villages were located on the sites that offered some natural protection, site such as elevated terrain, islands and peninsulas; otherwise they would have to build some artificial protection around their settlement. The larger early urban areas, with some exception, are found where the climate is relatively moderate. Geographic studies reveal that the most of the urban settlements are located on relatively flat terrain. Physical conditions derive the type of settlement, architecture, food, clothing, culture and civilization. Most of the hilly regions of North-East of India , prefer sloping roofs of their houses, so that in heavy rains the water could drain out of the roof. The people wear thick cloths for prevention from cold. Abundant water resource and fertile land encourage people to cultivate rice and hence rice has become the bread basket of this region. Similarly, in Rajasthan State, where the terrain is relatively flat, and rainfall and vegetation are less because of water scarcity, people go for flat roof, stone jails in their buildings and preferred to wear colourful cloths. The study area has been blessed with good ground water resources and the entire domestic demand for drinking water in Tinsukia district is met from ground water sources through a series of tube wells constructed in the study area.

Physical subsystem decides the boundaries of a particular settlement. Riverside towns are linear and somewhere hills and tributaries of river define the boundaries of the district. Town's physical subsystem consists of housing, public buildings, market and offices, parks and playgrounds, roads and bridges etc. Man's intervention converts natural environment into built environment. Urbanism brings about many changes in surrounding environment. Building occupying formerly open land, pavements on streets, smoke from vehicles and factories, can alter the climate. Solid and liquid wastes from housing, industries, market can destroy the natural environment. Environment and health are important for the masses and need to be preserved and conserved. This conservation requires health facilities and can be taken in use with the capital investment. Important thing is

that all the functioning of subsystems of the city, i.e., physical, social, and economic, ecology, environment, infrastructure and institutions are interlinked with each other.

7.3.2 SOCIAL SUBSYSTEM: Social subsystem can be observed in the behaviour pattern of the people, religion, caste-system, tradition, culture and civilization. Man is a social animal and society has been built by the hands of natural forces. The fear from animals, and natural calamities, inspired people to live in groups and hence they formed society. Communities are the part of nature and people have suffered from many evils they have inflicted on the environment. They have faced the necessity to improve economic security, correct social maladjustments, discard mass superstition, or resist seizure of power by autocrats bent upon personal glory and self-aggrandizement.

The main distinguisher of urban and rural system is the social and political organization. Social advancement lies in the people but can make permanent aesthetic changes. For example, the Romans built their cities complete with temple, theatre, stadium, great bath, and villas, etc. The built environment of Rome indicates the strong social, political and administrative structure of the city. The built environment of Orissa indicates the religious and architectural development of society, as there are so many temples built in stone and with a special style of architecture. Social advancement promotes education, administration and economy. Ancient times there were Religious schools, like Madarsa of Islam, Buddhist school and Ashrams of Hindus and these were there for religious education. However, in Gurukuls and Ashrams the lessons of physical training, meditation (Yoga), war, music, dance and drama were also taught. Rest of the culture was being transferred by old generation to next generation in the houses only. This education was restricted to a special caste of the society and boys only. Girls were taught in houses only. Nowadays with the consequence of social transformation the educational parameters are expanded, and education has become open to all the sectors of the society, and for both the genders. Field of education is also expanded from religion, war and arts to technology, marketing, advertisement, industrial training and several other sciences. Social gatherings, religious functions, sports conventions, fashion

shows, theatre, cinema, marriages, etc., are such parts of social subsystem which have major role in economic subsystem. The study reveals that the Tinsukia district is blessed with varied topography, owing to which the variety of social system is different. The literacy level of the district is much higher as compared to the national average but the quality of education falls below mark. The social and community facilities are centred within the major towns. The scope of advancement of the district by harnessing its natural resources is enormous but need to be realized by its citizens and the administration.

7.3.3 ECONOMIC SUBSYSTEM: People are engaged in economic activities to lead a comfortable life. The whole emphasis of activities is given on gaining and spending wealth. People want to upgrade their lifestyle, and this greed results in the multidimensional growth, in terms of economic activities. Money is required first to fulfil the basic needs (physical), and then to fulfil the demands (luxury and comfort). Economic development is dependent over availability of natural resources, human capital, education, technological advancement, public health, healthy social conditions and availability of market and customers. As the economic conditions are improved, more and more people are shifted from primary sector of economy (agriculture, forestry, fishery, horticulture and allied activities) to secondary sector (manufacturing units), and tertiary sectors (service, administration and education) and as the economy is developed, the GNP in primary sector would be decreased. The status of the economy of the region reveals that the contribution of tertiary and secondary sectors (net domestic product at current prices) is increased from Rupees 623077 in 2006-07 to Rupees 700228 in 2007-08, whereas the contribution of primary sector towards the total economy is very less for the corresponding period. It is evident from the analysis that both secondary and tertiary sector of the economy dominates the economic structure of the study area.

A high average level of real income per head is always associated with high proportion with working population engaged in tertiary sector. Primary sector of economy lies in the rural settlements and urban economy lies in secondary and tertiary sector. Manufacturing sector, i.e., industries is associated with the production of processed materials and goods. More the number of industries

require more number of skilled and unskilled manpower. This gives rise to housing requirement, market, health services, schools, and safety and security measures and in this way the tertiary sector of economy is naturally developed. The physical subsystem is affected by the economic subsystem in order to develop the industries and the other requirement of industries, i.e., housing, amenities and other infrastructural services. Secondary sector of economy requires a well developed infrastructure, i.e., water, electricity, sewerage system, roads, transportation, and market (commercial area; economic subsystem). This means that economic subsystem must be well supported by physical subsystem for its proper functioning. Industrial activities are very much essential for the development of the economy. As already discussed that tertiary sector has much dominance in the system, which shows that the study area is having more industrial activities. The study area has many tea estates, tea factories, industries and is the commercial hub of the state. The agriculture and its allied activities like horticulture, sericulture, fishery etc. may generate employment opportunities and also stimulate better economic development in the region.

The consequences of proper functioning of economic subsystem are the increase in the income and saving and improvement of lifestyle on one hand, and environmental degradation on the other. Industries produce smoke, dust, solid waste, waste water, chemicals, etc, which cause environment pollution. In this way the environmental subsystem is disturbed. If the balance between industrial production and environment is to be maintained, it also requires technological advancement to control pollution and also the assets to afford the applied the applied technologies. Economic growth then becomes necessary to sustainability, as it alone can provide the necessary financial resources and technological capacity required to deal with environmental problems. There is a strong relationship between economic, institutional, and social subsystem too. Whenever there is commercial, industrial or educational development, it attracts the people from different areas for employment opportunities. As the people from different places accumulate at a place, they bring different culture and this amalgamation of different cultures brings an altogether different culture. The social stratification which was done according to religion, cast and community is done over the basis

of occupation and economic status. The migration rate of the district is hiking due to insufficient infrastructural system, lack of higher education, political instability and poor social amenities.

This process leads to degraded economic development and social transformation in the system. One can conclude that the study area can have strong nexus between the economic subsystem and social and infrastructure subsystems with improvement and progressive integrated planning.

7.3.4 ECOLOGICAL SUBSYSTEM: Ecology and economics both the words are derived from a same root, which deals with “housekeeping” in the sense of management of man’s works. Extending economic cost-accounting to include the natural environment, as well as manmade structures and developments is an important step in redressing dangerous imbalances between these two necessary components of man’s total environment. Dibru-Saikhowa National Park, encircled by rivers Brahmaputra and Dibru, is a river island nestled in the lap of Lohit, Dibang and Dangori rivers. Spread over an area of 765 sq. km with a core area of 340 sq. km, it is one of the 14 Biosphere Reserves of India. It enjoys a tropical hot and humid climate with evergreen and semi evergreen forests. Varied vegetation has provided excellent habitat for large numbers of faunal and floral species among which several are globally threatened and endangered. The Dibru-Saikhowa ecosystem is home to a wide range of animals including mammals, birds, reptiles, amphibians, fishes, butterflies and insects. The Dehing Patkai region is bountifully rich in biodiversity. It falls under Indo- Burma hotspot, which is one of the twenty-five richest biodiversity hotspots of the world. The Indo-Burma hotspot comprises about 2 million square kilometers of tropical Asia, east of the Indian sub-continent. The region includes all of Cambodia, Laos, nearly the entire territories of Thailand, Myanmar and Bhutan, parts of Nepal, far eastern India and extreme south China, Hainan Islands in south China sea and Andaman Islands. The region is still revealing its biological treasures.

The ecological subsystem consists of many bio-systems. System is a regularly interacting of interdependent group of items forming a unified whole. The communities (human and animal) and non-living environment function together as an ecological system or ecosystem. Urban subsystem contain human population,

bird and animal population, large number of trees substantial area of grass and shrubs, and in many cases, lakes and ponds-so they do have a autotrophic components or green belt. This large system can be compared with a large, mature forest, like a large elephant which have a tremendous metabolism and requires a large flow of energy to sustain it. There is no such thing as steady thing as a large stone, but the circulation of energies within the body, be it a city, forest or body of an elephant. Sometimes elephant may not get food, or forest may not get rains, but they have ability to sustain for some time, even without fulfilment of all the needs. Natural ecosystem has this ability. Whatever the hazards occur, nature has ability to come back into its own, original and healthy state, but this ability is rarely found in the urban system, as the urban system is the fuel-powered ecosystem, or industrial system. Here, highly concentrated potential energy of fuel replaces, rather than merely supplements, sun energy. The other sources of energy are non-renewable and hence non-sustainable. The natural water resources available in the study area should be prevented from all kinds of pollution and also much attention must be given for maintain its ecological balance in the system.

7.3.5 ENVIRONMENTAL SUBSYSTEM: Natural environment cannot provide the comfortable living conditions to mankind; it has to be moulded in such a way that the resultant built environment can give safety from harsh natural conditions and animals. Built environment consists of buildings, barricades, roads, parks, playgrounds, etc. Towns themselves an unique form of natural, built and cultural environment. As a natural environment, towns have their own distinctive properties, such as the urban heat island, wind tunnels created by large buildings, and air intervention effects, etc. Yet the natural environment is moulded into artificial environment, but in the absence of favourable built environment human health may suffer a lot. The functions of natural environmental subsystem are:

- There are natural resources for production and consumption, principally raw materials and energy.
- The natural environment operates as a sink for society's waste products, and
- It provides a series of free services; like fresh air, water and vegetation.

The relation between physical, and economic subsystem can be understood. If the physical subsystem is not built properly then the human physical and mental health is badly affected and to get rid of this difficulty, the support of social and institutional subsystem (health services) and economic subsystem (funds for availing the health services) is required. Urban environmental subsystem is not just the built environment, but the social, economic and political environment. Social, economic, and political environment determine the quality and growth of the physical environment. Environment means physical conditions, not psychological. The total environment of the city consists of this entire environment. Urban sprawl can pose particular problems by eating into valuable natural habitats, whilst cities also pass on some of their impacts, making intensive demands on the natural resources of their hinterlands, such as quarries for building materials. Estimation of economic value of the natural resources is never ever done before its over-exploitation, however the commodities which are made out of these natural resources, or with the help of these resources have their own market price. One can conclude based on the above that there is a strong relationship and interdependency among the environmental, physical, economic and ecological subsystems

7.3.6 INFRASTRUCTURAL SUBSYSTEM: Urbanization and the phase of its acceleration is the foremost important aspect in deciding the level of the kinds of infrastructure requirement in the urban system, for its development. The features of urban population are changing not only as a result of its dynamism, but also the national development in which it belongs. Cities, towns, and urban agglomerations are expanding faster in most of the regions of the world than the overall growth of the population, due to availability of infrastructure services in the particular system. Infrastructure is divided in to three types, which include physical, economic and social infrastructure.

- ❖ **Physical:** water, drainage, sewerage, solid waste management system, roads, rails, gas, airways, and waterways, etc.

- ❖ **Economic:** All kinds of work centres, workshops, industries, trade and commercial centres, banks and financial institutions, advertisement institutions, legal firms, broker office, online transaction centres etc.
- ❖ **Social:** parks, nurseries, water bodies, accessibility to internet connection, e-governance, education and health institutions, Police and defence services, Economic back-up and institutional framework readily available at the time of floods, earthquakes, or any other natural calamity, etc.

These entire three infrastructures are very much essential for the development of any urban system. In India, the urban system which has more infrastructure services developed further, and continuously growing with higher intensity, whereas the urban system has less infrastructure services grows with less intensity. Provision of required amount of infrastructure services to the Indian urban system becomes a mirage, due to the functions of population explosion in the urban system on one hand, and the Government of India and the respective State Governments attitudes on the other. Further, it has been also observed from various studies that whatever infrastructure is made available in the urban system by the Government of India and by the respective State Governments, turning into a drop in the ocean, due to the functions of population explosion, in the urban system. Various studies proved that there is strong nexus between infrastructure services and economic development in the urban systems. According to United Nations, “Cities are the engines of economic development “but, according to the investigator’s view, without required amount of infrastructure services in the urban system, the cities cannot be the engines of economic development.

The population of the Indian cities is growing and there is rapid growth in demand. Indeed, there is a wide gap between demand and supply as because of migration large number of people is coming towards city, the demand for infrastructure is more and supply is less. There is lack of resources, and even the financial resources are less. Institutional parameters show that there is lack of public and private partnership for the development of infrastructure. The use of ineffective and obsolete technologies is also the governing factor for poor infrastructure

development. Even if the physical infrastructure is built, the lack of maintenance pulls it behind and leaves in unusable state.

7.3.7 INSTITUTIONAL SUBSYSTEM: Integrated functioning local governing bodies, working for planning, development and maintenance of the region are required for the holistic development of the city or region.

7.4 GROWTH POLE THEORY: Francois Perroux introduced the concept of economic *Growth Poles* in 1949. The core idea of the growth poles theory is economic development, or growth, which is not uniform over an entire region, but instead takes place around a specific pole. The concept of growth pole is presented in the Figure no.7.02. This pole is often characterized by a key industry around which linked industries develop, mainly through direct and indirect effects. The expansion of this key industry implies the expansion of output, employment, related investments, as well as new technologies and new industrial sectors. The regional development is imbalanced, because of agglomeration economies taken place near the growth pole. Transportation, especially transport terminals, can play a significant role in such a process. Transportation plays a very significant role in developing growth poles, since it is the only mean, which is used for resource mobilization, commutation, recreation, day to day activities and other purposes. The more dependent or related an activity is to transportation, the more likely and strong this relationship. At a later stage, the emergence of a secondary growth pole is possible, mainly if a secondary industrial sector emerges with its own linked industries.

means of the incomes it generates (income polarization); or stimulates an increase of the regional economy by causing a progressive concentration of new activities (psychological and geographical polarization). To the extent that the growth pole concept has a functional character, Vanneste (1971) argues that it would be wrong to neglect the spatial aspect and the geographical implications of the concept. If the growth pole has a local geographical base, then it is safe to assume that it can induce external economies in local firms. This means that growth is induced not only through direct trading between firms located in the same geographic area, but also through a structural change in the region. In that sense, Monsted (1974) asserts that local trade and business, which are not even directly associated with the growth pole will experience high demand induced by better resources and wages in the region. Bhandari (2006) thinks that the geographical aspects of growth poles are now considered to be the most important facet of growth pole theory. As already pointed out, the growth pole concept involves an enormous confusion of ideas, which makes it extremely difficult to put forward a clear definition of it.

The Geography Dictionary (2004) defines growth poles as follows:

“A point of economic growth. Growth poles are usually urban locations, benefiting from agglomeration economies, and should interact with surrounding areas, spreading prosperity from the core to the periphery”. This definition presupposes a linkage between growth poles, economic growth and urbanization, as well as potential interaction effects. The linkage is so crucial that it deserves further discussion.

7.4.2 Linkage between Cities as Growth Poles and Urbanization: To better understand the linkage between cities as growth poles and urbanization, it is important that we define the salient terms such as: urban area, urbanization, and urban growth. By an *urban area*, we mean a settlement or a locality defined as “urban” by national statistical agencies, generally on the basis of population concentration. An urban area may also be defined in terms of land use types and industrial categories. Thus, an urban area may be defined as an area characterized by social, economic and institutional activities which are predominantly based on the manufacture, production, distribution, or provision of goods and services other

than agricultural uses, or the extraction of natural resources in unprocessed form, or low density residential development.

Urbanization is defined as: (a) the social process whereby cities grow and societies become more urban; (b) the process of the formation and growth of cities; or (c) a historical transition from being mostly rural to predominantly urban. In statistical terms, urbanization reflects an increase in the percentage of a country's total population that lives in towns and cities. This number represents the level of urbanization of a country. The *rate of urbanization* is the speed at which the percentage of the total population living in towns and cities is growing. The urban population trend among the selected regions of the world is presented in the Table 6.01. This table reveals that although urbanization is a global phenomenon, yet the level and rate of urbanization vary significantly across geographical areas, regions and countries. On one hand, Africa has the lowest level of urbanization, approximately 39 percent in 2007, compared to 48 percent in Asia, 72 percent in Europe, 78 percent in Latin American, and 81 percent in North America on one hand, the rate of urbanization in Africa since 1950 is the highest among all the continents in the world, on the other.

Table 7.01: Urban Population Trend 1950-2030, selected Periods & Regions

Sl.No.	Region	Percent of Total Urban population					Rate of Urban Growth(%)				
		1950	1980	2000	2010	2030	1950-55	1980-85	2000-05	2010-15	2025-30
1	World (Total)	29.10	39.10	46.60	50.60	59.60	3.00	2.70	2.10	1.90	1.50
2	More Developed	52.50	68.80	73.10	75.00	80.60	2.30	0.90	0.60	0.50	0.40
3	Less Developed	18.00	29.60	40.20	45.30	56.00	3.80	3.70	2.70	2.40	1.80
4	Africa	14.50	27.90	35.90	39.90	50.00	4.70	4.30	3.90	3.20	2.90
5	Asia	16.80	26.30	37.10	42.50	54.10	3.50	3.60	2.50	2.30	1.80
6	Europe	51.20	68.00	71.40	72.60	77.80	2.00	0.79	0.21	0.17	0.14
7	Latin America/ The Caribbean	41.40	64.90	75.30	79.40	84.60	4.40	3.00	2.00	1.50	0.98
8	North America	63.90	73.90	79.10	82.10	86.70	2.70	1.20	1.40	1.20	0.86
9	South America	42.70	68.30	79.50	83.70	88.30	4.60	3.10	2.00	1.50	0.91
10	Australia/New Zealand	76.20	85.40	86.90	88.70	88.30	2.80	1.20	1.40	1.00	0.82

Source: Compiled by the Investigator based on the United Nations (2008), Population Division, the Department of Economic and Social Affairs, 2008-09

One of the important indices of population concentration is the density of population. It is defined as the number of persons per square kilometre. Details of population density of India are presented in Table 6.02. This table reveals that the population density of

India in 2001 was 324 persons per square kilometre, which shows that now 57 more people live in a square kilometre area in the country than the number that lived a decade ago.

Table 7.02: Density of population, India: 1901-2001

Sl.no.	Year	Density (per Sq.Km)
1	1901	77
2	1911	82
3	1921	81
4	1931	90
5	1941	103
6	1951	117
7	1961	142
8	1971	177
9	1981	216
10	1991	267
11	2001	324

Source: Compiled by the Investigator based on Census of India, 2001

The population density of India from 1901 to 2001 is presented in Table 7.02. This table reveals that at the beginning of the twentieth century i.e. in 1901 the density of India was as low as 77 and this steadily increased from one decade to another to reach 324 in 2001. The persons living in per sq. km. has increased by 21.3 per cent in 2001 as compared to 1991. High increase in the density of population is a matter of great concern as it puts immense pressure on our natural resources and also it may adversely affect the quality of life. Due to difference in climatic conditions, availability of resources etc., the states and Union territories of our country largely varied in terms of density. It is, therefore, essential to analyze the variations across the States and Union territories. Ranking of States and Union territories by density between the year 1991 and 2001 is presented in Table 7.03. This table reveals that the population density within the country widely varies across the States and Union territories. It varied from 13 persons per sq. km. in Arunachal Pradesh to 9294 in Delhi. Further, it has been observed from the table that density of population has been increased in all States and Union territories of India between 1991 and 2001, but one can understand the huge variations in the rate of increase in density.

Further, this table indicates that among major states, West Bengal is still the most thickly populated, where population density has gone up from 767 in 1991 to 904 in

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2001. However, among major states, Bihar is now the second highest densely populated State pushing Kerala to the third spot in terms of ranking. Similarly, Punjab and Tamil Nadu have now interchanged their relative position of tenth and eleventh ranks respectively in 1991.

Table no. 7.03: Ranking of States and Union Territories by density

Sl.No.	Rank in 2001	States / Union Territories*	Density (per Sq. Km)		Rank in 1991
			2001	1991	
1	1	Delhi *	9,294	6,352	1
2	2	Chandigarh *	7903	5632	2
3	3	Pondicherry *	2029	1683	3
4	4	Lakshadweep *	1894	1616	4
5	5	Daman & Diu *	1411	907	5
6	6	West Bengal	904	767	6
7	7	Bihar	880	685	8
8	8	Kerala	819	749	7
9	9	Uttar Pradesh	689	548	9
10	10	Punjab	482	403	11
11	11	Tamil Nadu	478	429	10
12	12	Haryana	477	372	12
13	13	Dadra & Nagar Haveli *	449	282	15
14	14	Goa	363	316	13
15	15	Assam	340	286	14
16	16	Jharkhand	338	274	16
17	17	Maharashtra	314	257	18
18	18	Tripura	304	263	17
19	19	Andhra Pradesh	275	242	19
20	20	Karnataka	275	235	20
21	21	Gujarat	258	211	21
22	22	Orissa	236	203	22
23	23	Madhya Pradesh	196	158	23
24	24	Rajasthan	165	129	26
25	25	Uttaranchal	159	133	24
26	26	Chhattisgarh	154	130	25
27	27	Nagaland	120	73	31
28	28	Himachal Pradesh	109	93	27
29	29	Manipur	107	82	28
30	30	Meghalaya	103	79	29
31	31	Jammu and Kashmir	99	77	30
32	32	Sikkim	76	57	32
33	33	Andaman & Nicobar Islands *	43	34	33
34	34	Mizoram	42	33	34

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35	35	Arunachal Pradesh	13	10	35
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Source: Compiled by the Investigator based on Census of India, 2001

It can be deduced from the above table that the population density of Assam has rose from 286 persons per sq.km in 1991 to 340 persons per sq.km. Tinsukia district's present population density is 303 persons per sq.km which is way behind the densely populated states of India.

An attempt has been made by the Investigator to understand the differentials in population densities across the six regions in the country. The variation of population, distribution of States and Union territories by density in different regions between the year 1991 and 2001 is presented in the Table 7.04. This table reveal that the Eastern region has by far the highest density and the North Eastern region the lowest. Eastern region has recorded the highest increase in density from 431 in 1991 to 525 in 2001 followed by Central region and Western region respectively.

Table 7.04: Distribution of States and U.T. by density in different regions

Sl.No.	Region	States / Union Territories*	Number of States / Union Territories	Density (per Sq.Km)	
				1991	2001
1	Northern	Jammu & Kashmir	7	174	223
		Himachal Pradesh			
		Punjab			
		Chandigarh*			
		Haryana			
		Delhi*			
		Rajasthan			
2	Central	Uttaranchal	4	278	347
		Uttar Pradesh			
		Chhatisgarh			
		Madhya Pradesh			
3	Eastern	Bihar	6	431	525
		Sikkim			
		West Bengal			
		Jharkhand			
		Orissa			
		Andaman & Nicobar Islands*			
4	North East	Arunachal Pradesh	7	124	151
		Nagaland			
		Manipur			
		Mizoram			

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		Tripura			
		Meghalaya			
		Assam			
5	Western	Gujarat			
		Daman & Diu*			
		Dadra & Nagar Haveli*			
		Maharashtra	4	239	293
6	Southern	Andhra Pradesh			
		Karnataka			
		Goa			
		Lakshadweep*			
		Kerala			
		Tamil Nadu			
		Pondicherry*	7	310	351

Source: Compiled by the Investigator based on Census of India, 2001 (Note * denotes the Union Territories)

The growth pole concept was originally conceived within “economic space”, but later transposed into “geographical space”. By conceptualizing growth pole in spatial terms, economists sought for a link between growth pole theory and urban accumulation and concentration (Monsted, 1974; Parr, 1999; Bertenelli and Strobl, 2003). The assumption was that cities with their accumulation and concentration of population and capital resources (agglomeration economies) could become growth poles. That being the case, Penouli (1972) and Friedman (1966) have treated growth poles as centers from which innovations and progress are diffused. A historical trend has been documented from the developed, industrialized countries suggesting that growth and development start from points of accumulation and concentration within a geographic area (growth poles). The argument is that these growth poles have the potential of giving birth to other centres of accumulation and concentration. The process is seen as a natural progression in the urbanization process, where relative growth in a country’s urban population is accompanied by an even faster increase in the economic, political, and cultural importance of cities (World Bank, 2000). The conclusion is that the level of urbanization is highest in the most developed, high-income countries and lowest in the least developed, low-income countries.

The growth pole approach to economic development in developing countries was formulated on the presumption that by deliberately focusing of investment at a limited number of centres, a necessary condition for development would be satisfied (Parr, 1998). As a result, the growth pole concept generated considerable intuitive appeal

among policy makers. The role of economists, urban and regional planners, and allied social scientists became important in providing insights to governments and national leaders in their efforts to unravel the complexities of the growth pole strategy, as they grappled with high levels of urbanization. As Thayer Watkins (Darwent, 1969) put it, "*The policy makers presumed that economists could supply the technical analysis needed to make sense of the policies based upon the concept of growth poles*". The conception of cities as growth poles in the urbanization process sparked a momentum to jumpstart economic growth in developing and industrializing countries in the 1960s and 1970s, mostly countries in Latin America and Southeast Asia, by pursuing a growth pole strategy. Planners and development economists set about identifying locations, which they believed, could act as growth poles or growth centres in the national urban system.

Naturally established cities were activated as growth poles and strategically located points in a region were artificially induced as growth poles. These poles tended to be secondary cities within the national urban hierarchy places that could grow to fill the gap between the primary city and smaller places (Mitchell-Weaver, 1991).

When the economic concept of growth pole was linked specifically to that of geographical poles of investment, it gave rise to dialectical relationship between the concepts of *growth* and *development* (Mitchell-Weaver, 1991; Monsted, 1974). Based on the writings of Perroux in the late 1960s, Mitchell-Weaver (1991) offers an important distinction between growth in a region and development in a region. Growth is defined as "*a steady rise of the indicator of a dimension of the total economy in the region or a nation*", while development is defined as "*a combination of mental and social changes in population, which enables total production to grow, both cumulatively and permanently*". In other words, economic growth can be stimulated through cities as growth poles without being accompanied by development.

Francois Perroux's original work focuses on the development of growth poles in economic spaces. He developed a typology of economic spaces, the most important being that of economic space as a field of forces, from which he derived the notion of a pole as a vector of economic forces "as a field of forces, economic space consists of centres (poles or foci) from which centrifugal forces emanate and to which centripetal forces are attracted". Perroux did acknowledge that growth poles would also exist in geographical space, but it was Bourdville who extended the original theory to include

more comprehensively the geographical dimension. To keep the distinctions clear and in perspective, the term growth pole can be taken to refer to the original concept of Perroux without any specific geographical dimension, while the term growth centre or growth point refers to a spatial location. The following basic economic concept and their geographical developments can be identified through growth poles and growth centres.

- 7.4.3 The concept of leading industries:** The concept of leading industries and propulsive firms, states that at the centre of growth poles are large propulsive firms belonging to leading industries which dominate other economic units. There may be just one single dominant propulsive firm or a core of them forming an industrial complex. The original geographical location of such industries in certain focal points in a region may be due to several factors i.e., the localization of natural resources (water/ shelter/fuel), the localization of more man-made advantages (communications or existing service-based central places with advantages of infrastructure and labour supply), or possibly just chance. In reality, the growth points are often grafted on to the existing framework of central places.
- 7.4.4 The concept of polarization:** The concept of polarization states that the rapid growth of the leading industries (propulsive growth) induces the polarization of other economic units into the pole of growth. Implicit in this process of polarization are the various agglomeration economies (internal and external economies of scale). This economic polarization will inevitably lead to geographical polarization with the flow of resources to and the concentration of economic activity at a limited number of centres within a region. Even when the original raison the centre of such locations disappears, they will often continue to prosper due to the presence of the agglomeration economies.
- 7.4.5 The concept of spread effects:** The concept of spread effects states that in time the dynamic propulsive qualities of the growth pole radiate outwards into the surrounding space, These 'trickling down' or 'spread' effects are particularly attractive to the regional planner and have contributed much to the recent popularity of the theory as a policy tool.

7.5 INDUSTRIAL PROFILE OF TINSUKIA DISTRICT: The Department of Industries & Commerce, Govt. of Assam has set up Directorate of Industries & Commerce for overall development of industries in Assam. The schemes/ plans and programmes drawn in time-to-time are implemented through the Directorate of Industries & Commerce for sustainable growth of industries in Assam. The Industries & Commerce Centre (DICC) is being identified as the core centres for implementation of various industrial schemes. Each DICC is responsible for overall industrial growth in the concerned district.

7.5.1 ELEVENTH FIVE YEAR PLAN 2007-12: The proposed outlay for the 11th Five Year Plan is Rs.4195.00 lakh and out of which the proposed quantified outlay for TSP & SCCP are Rs.200.00 lakh and Rs.235.00 lakh respectively. The following are the schemes/projects operated during the 10th Plan period which will be continued during the 11th five year plan period.

7.5.2 ANNUAL PLAN 2010-11: The proposed outlay for the Annual Plan 2010-11 is Rs. 1314.00 lakh.

7.5.3 WOMEN EMPOWERMENT IN EACH SECTOR: During the 11th Five Year Plan an outlay of Rs.350.00 lakh has been proposed under women component plan against the total proposed outlay of Rs.4195.00 lakh. The target proposed for 11th Five Year Plan for the benefit of women is 500 numbers and for the Annual Plan 2009-10 the target proposed at 100 numbers. It is proposed to conduct at least 3 EDPs in each district for general purpose comprising with 25 entrepreneurs in each batch. The Industries & Commerce Department arranges the programme with other organization like SIDBI, NEC, NSIC, IIE, NEITCO and Science & Technology Dept. etc. The proposed outlay for women component for the annual plan 2010-11 for an amount of Rs.40.00 lakh and the target proposed are 160 numbers.

7.5.4 INDUSTRIES, FACTORIES AND SMALL SCALE INDUSTRIES: Tinsukia district can boast of one among the highest contributor of revenue generation through industries, factories, cottage industries etc. in the state of Assam. The details of various industries are listed below in the tables and figure:

Table 7.05: Distribution of Registered Factories and Workers in Tinsukia district, 2008
(As per NIC)

Distribution of Registered Factories and Workers in Tinsukia district, 2008 (As per NIC)			
Sl. No	Type of Industry	Factories	Workers
1	Mining of Coal	2	10
2	Manufacturing of food products	210	12602
3	Manufacturing of Textiles	2	20
4	Manufacturing of Wood	98	3798
5	Manufacturing of Paper	3	35
6	Printing	2	40
7	Manufacturing of Coke, petroleum	5	703
8	Manufacturing of Chemical	5	26
9	Manufacturing of Rubber	18	979
10	Manufacturing of Non-metallic minerals	56	1110
11	Manufacturing of Basic metals	19	438
12	Manufacturing of Fabricated metals	24	282
13	Manufacturing of Machinery	20	437
14	Manufacturing of Electrical Machinery	5	55
15	Manufacturing of Furniture	1	15
16	Electricity, gas, steam, hot water supply	6	78
17	Collection, purification of water	3	31
18	Maintenance of Motor vehicles	14	318
19	Retail trade	3	36
20	Auxillary transport activities	5	112
	Total	501	21125

Source: District Statistical Handbook, 2008

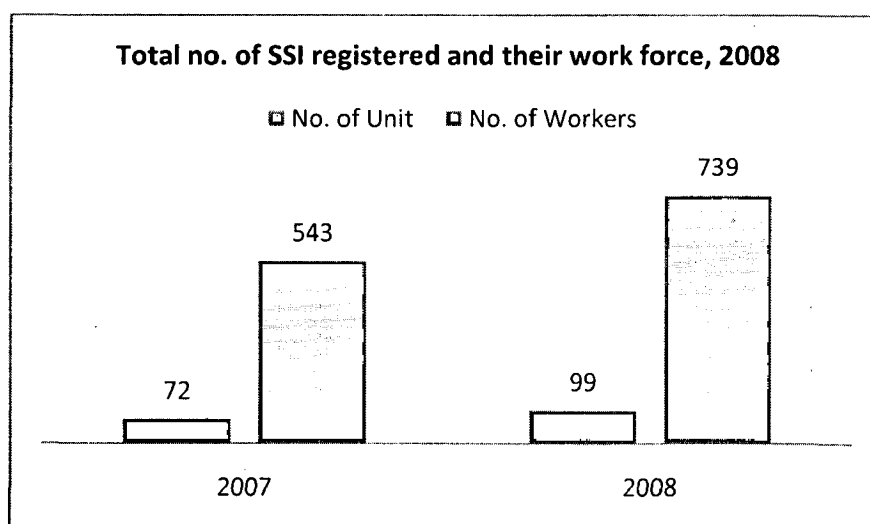


Figure 7.03: No. of Small Scale Industries registered in Tinsukia, 2008

Table 7.06: Distribution of Number of units established by Type of Industries, 2008 (As per NIC)

Number of units established by Type of Industries, 2008 (As per NIC)			
Sl. No	Type of Industry	Industry	Workers
1	Agro based	27	309
2	Forest based	4	63
3	Textile based	14	50
4	Chemical based	3	25
5	Engineering based	29	188
6	Electronic based	2	9
7	Mineral based	3	31
8	Leather based	1	3
9	Rubber based	1	5
10	Miscellaneous based	15	56
	Total	99	739

Source: District Statistical Handbook, 2008

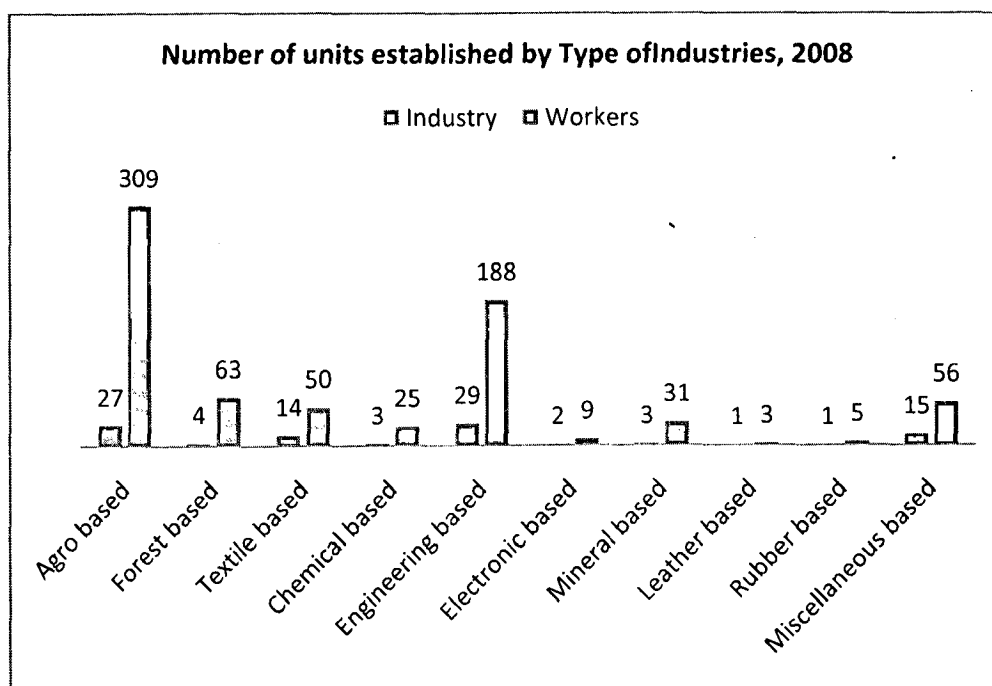


Figure 7.04: No. of Small Scale Industries registered in Tinsukia, 2008

It can be deduced from the above figure that the manpower involved in the agro based industries is maximum in the district. Second in the bar is the engineering based industries to engage the workforce and provide second most employment. The number of engineering and agro based industries is also more in the district as compared to other industries.

7.5.5 INDUSTRIAL GROWTH CENTRE: The Govt. of India has taken up the programme of setting up Industrial Growth Centres in different locations in different states. As per North East Policy the Govt. of India will make available 15 crores as grant for such centres while the balance expenditure will have to be met by the Govt. The State Govt. has entrusted AIDC to establish two growth centres one at Chariduar in Sonitpur District and the other at Matia in Goalpara District, which are already in various stages of construction. The third growth centre approved by the Govt. of India which is being set up at Chhaygaon in Kamrup, which is implemented through Assam Industrial Infrastructure Dev. Corp. In the 11th five year plan an outlay of Rs.1400.00 lakh has been earmarked with a provision of Rs.1150.00 lakh in the Annual Plan 2010-11 as state Govt. share. The growth centre of Tinsukia is Talap with an area of 2,676 sq. Metre with three numbers of constructed sheds.

7.5.6 PLASTIC PARK: In order to maximize the development potential of the Assam Gas Cracker unit, a Plastic Park is proposed to be set up near Tinsukia at Gelapukhuri for developing downstream industries based on the outputs from the Gas Cracker unit. The value addition will ensure more revenues to the State as well as generate more local employment and will result in an overall social and economic development of the region.

The land cost has been assessed at around Rs.30 crores. As the land is patta (tea garden) land, it will have to be acquired and sufficient fund will have to be earmarked for acquisition of the land. A Techno-Economic Feasibility Report has already been prepared to assess the viability of the project.

In order to initiate action for land acquisition activities and to prepare the feasibility report, an amount of Rs.495.00 lakh released in the Annual Plan 2008-09. During the current financial year Rs.400.00 lakh has been earmarked and expected to be released. An amount of Rs.1700.00 lakh has been proposed in the Annual Plan 2010-11 for land acquisition cost.

CHAPTER – 08

RESULTS, FINDINGS AND VISION

The investigator has thoroughly analyzed literature, profile of the study area, primary data, secondary data and the analysis of the primary household survey. The results and findings from different studies are made at various stages and are presented below:

8.1 FINDINGS BASED ON STUDY AREA:

1. The study area is characterized by different landforms, valleys, terrains and mostly plains. Due to the varied landforms, the occupational structure of the people varies.
2. Tinsukia district experiences average annual rainfall of 2800 mm and average rainy days are 140 to 150 days per year, therefore, the predominant crop produced is paddy. Other crops favorable to dry climate are not produced in this region.
3. In the study area, certain pockets are confined in the low lying area; and also affected by water logging flooding and bank erosion, during the monsoon season, which affects the day to day life of the households by flooding on roads, residential areas, work places, farmlands get submerged and the fertile lands cannot be utilized to the fullest.
4. Tinsukia can boast of one of the biggest wholesale market in North east region. A large number of shopping centers are under construction and some have already been inaugurated. Due to these commercial activities, it is of economical growth and importance.
5. The existing road network is unable to cater the present requirement of the urban transportation system. The existing public transportation facilities are poor that forced the people to procure their own vehicle for their mobility. State highways are also contributing in population distribution and all major settlements are connected via metalled road. Most often these roads due to heavy monsoons tend to crack and get damaged.
6. The district has no major irrigation project. There are only medium, minor and lift irrigation projects which cover only 2.7% of the total cultivable area. So, the agricultural activities in the district are mainly rain fed.
7. The quality of water in most parts of the Tinsukia district ranges from bad to worst. The uneven geographical nature of the district leads to concentration of iron and minerals in

many parts of Tinsukia. There is a dire urgency of centralized water supply to be maintained by the administration. Most households depend on individual motor-pumps, hand-pumps and wells.

8. There is extreme shortage of power in the district. In spite of the mighty Brahmaputra flowing length and breadth of the district, the district has dearth of power/ electricity.
9. The study reveals that the current drains are incapable of carrying the surface water especially in the monsoon seasons. The system has to be redesigned to meet the future requirements for increasing population. The areas uncovered with drains should also be provided with storm water drainage facilities and the coverage area of existing system should be extended, especially in the urban area.
10. The study area is blessed with many Bio-systems, Bio-reserves, Wild life sanctuaries and National parks. Eco-Tourism industry can be well setup in the region using its ecological gifts.
11. Social infrastructure facilities, such as, schools, health centers, convenient shopping, markets and recreation facilities are scattered throughout the study area, but they are not accessible to all sections of the community.
12. Trained, educated human resources are abundant in the study area. Unemployment is rampant and majority of them are migrating to other states of the country for education and employment.
13. In the study area, the dwelling units are detached in nature and scattered throughout out the geographical area. The residences confined besides the major transportation networks are having two or more floors, and those live in interior and in the outskirts are having single storied.
14. The study area does not have good number of education facilities to cater the needs of its masses. Setting up of professional educational institutions; including engineering and medical colleges should be on the priority list as of now, which would distract the migration in the region.

15. There is tremendous potential for agricultural and its allied activity's development. Fishery business, sericulture, Bamboo business, harnessing natural power like hydro power, wind power etc. can be improvised by incorporating appropriate technologies.
16. Fishing and its allied activities are the major source and income earning opportunities to this community and their economic condition is very poor. They are prone to all kinds of natural hazards, during the monsoon season, due to having poor quality of housing.

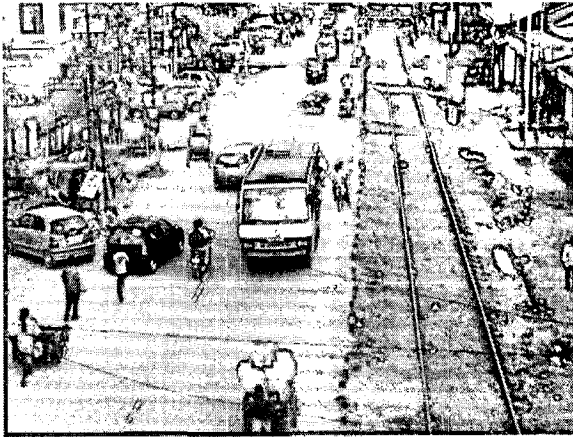


Fig 8.01: Narrow and unclean State Highways **Fig 8.02: Vehicular pressure on Streets**



Fig 8.03: Poor Quality Drainage system **Fig 8.04: Absence of Solid waste management**



Fig 8.05: Natural water bodies and Lakes



Fig 8.06: Maintenance of Broken Roads



Fig 8.07: Rural roads

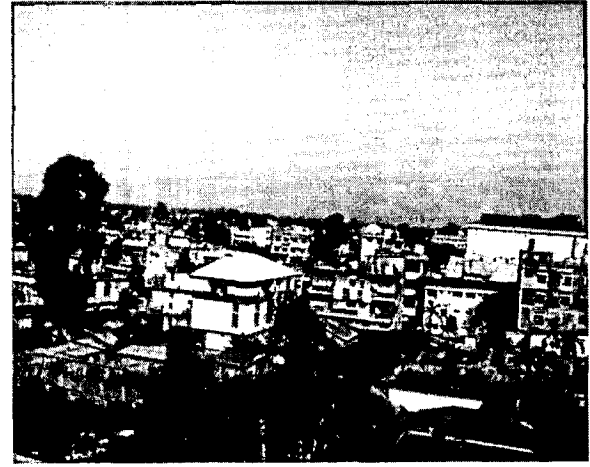


Fig 8.08: Tinsukia district is mostly Plain



Fig 8.09: Education: Rural School Students



Fig 8.10: Health: Village Sub-Centre



Fig 8.11: Agricultural farmlands

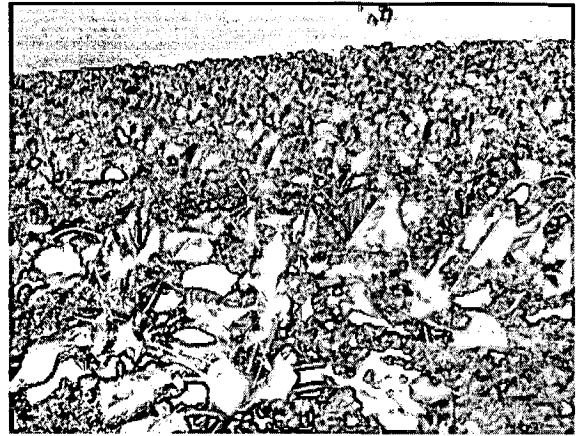


Fig 8.12: Allied activities: Horticulture



Fig 8.13: Rural Kutcha Houses

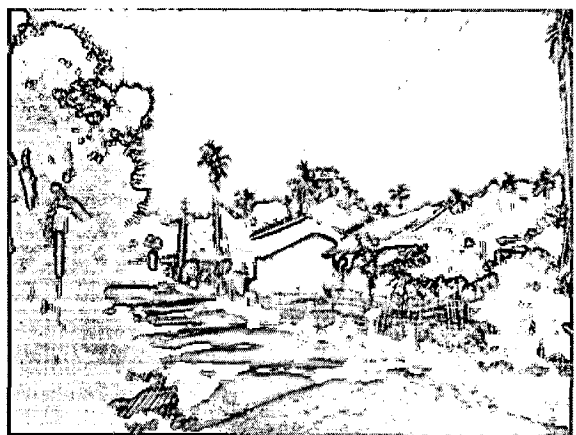


Fig 8.14: Rural Roads and poor drainage



Fig 8.15: Weekly market (Rural area)



Fig 8.16: Daily market (Urban area)

8.2 FINDINGS BASED ON HOUSEHOLD SURVEY: In this present investigation, different kinds of analysis are made based on the primary household survey and the following very important findings are observed from the survey. They are:

1. The population in the lower income groups is more than the higher income groups and decreases with increase in income.
2. About half of the household are confined in the lowest income group of 0-10,000 among the surveyed households.
3. The study area has three predominant castes, general (36 per cent), OBC (25 per cent) and SC (25 per cent). As the region is confined in the North eastern part of India, the influence of schedule caste and schedule tribes is more as compared to other parts of the country.
4. About three fourth (75 per cent) of the total surveyed population lies in the working class, i.e., 15 years to 60 years. Rest one fourth (25 per cent) comprises of children and aged people. This shows that the human resource is more in number and can lead to development of the district, if properly utilized.
5. The average size of the family is above six, i.e., 6.18, which shows that people are not practicing family planning measures. This is not a very good symptom for development.
6. The study of the marital status of the system shows that there is parity amongst the married and unmarried population. This means that unlike many states of India, there are no incidences of social evils like “sati”, child marriage, etc. This is a very good sign of social upliftment and future growth.
7. Education is one of the most important parameters, which is the backbone for the development of the country. It can be concluded from the study that there is high awareness for literacy in the district and just 11 per cent of the total surveyed population is illiterate, which can be zeroed down with reinforcement in the educational sector. The level of higher education is very low as compared to basic education.
8. The literacy level of the population is penetrated in almost all the segments of the society, i.e., from the lowest income group to highest income group.

9. The employment scenario is rather poor as more than half (57 per cent) of the total survey are unemployed. More people are in the government sector and the rest are distributed within other sectors.
10. Most of the population is engaged in agricultural and its allied activities. The secondary and tertiary commonly share the second position.
11. In the given system, more than half (57 per cent) of the population spend on food. In the rural setup, in many households 90 percent expenditure is on food. Lack of physical infrastructure and also poor provision of public and rural transport are reason why people spend more on this amenity.
12. The availability of government schools and institutions has helped the masses and due to which the expenditure on education is less. A diminutive 3 per cent population spends on community or recreational facilities. This is due to the fact that the required amount of physical and social infrastructure is not available.
13. The households of the lower income group save less and their income is spent completely every month. With increase in income, the saving of the households also increases. Further, rest of the households also save considerable amount of money, which shows that the people in the study area contribute more in capital formation through savings. This is one of the most important parameters, which decide the functions of the economic growth in our country.
14. The expenditure pattern of the North eastern region is a bit different. People with higher income tend to spend more on recreational, clothing and educational amenities. The second stature is spending on food, transport and health. This shows that the people in this system have a desire for quality of life rather than just fulfilling the basic necessities.
15. The higher income households are well educated and aware enough to invest their income and opt more for loans and financial institutions.
16. The energy expenditure in the study area is more on LPG, fuel wood and petrol.
17. Expenditure on fuels for travelling purpose depends on availability and extent of use of vehicles in the system. More use of personal vehicles and more expenditure on energy show the economic strength of the people as well as compulsion of the people living in the system.

18. In the villages under the tea estates, a specific amount of LPG cylinders and fuelwood is provided by the organization free of cost. This reduces their expenses on these amenities.
19. The tea estate managed villages get the benefit of public distribution system of food (rice and wheat) at a much minimized rate of 75 paise per kg.
20. There is a recent development in the North-eastern region and mainly in the district of Tinsukia in the form of "Pipeline Gas". It is efficient and eco-friendly gas free of harmful smoke. This system is yet to reach the grassroots level of the system but has already taken strong front in energy consumption pattern in the urban system.
21. The households earning more than 40,000 spend almost two third (59 per cent) on pipeline gas supply infrastructure. With better metering and supply system the energy consumption for cooking purpose can be optimized in this region.
22. There is extreme potential in the study area to generate energy from "Biogas" and use it as an alternative source of energy. Due to poor infrastructural facilities and lack of effort by the state government in this sector, the development of biogas plant is not successful. All the waste generated by the livestock is used in the farmland instead of manures and fertilizers. This has an impact on the low productivity of the crops. By harnessing the potential of biogas plants, the economy could have been vibrant and flourishing.
23. Almost half (50 per cent) of the total respondents live in pucca houses, rest of them comprise of the people living in semi pucca and kutchha houses. This shows disparity in their social structure.
24. There about one tenth (10 per cent) households who have taken assistance from the financial institutions to build their houses. This implies that people seeking financial services from the institutions are more in the higher income group because with improved monthly pay people tend to spend more on physical comfort and construct frame structure houses with more no. of rooms. Households taking bank assistance are increasing from income category one to five exponentially. There are three fourth (74 per cent) households who have built their houses on their own expenses and just 16 per cent households who have inherited their ancestral property.

25. There is no public water supply in the system apart from the tube-wells and hand pumps for each village. The households manage their own water supply system, which is in most of the cases do with hand pump and motor pumps.
26. The quality of the water is poor. Here, about half (45 per cent) of the respondents opinioned that the water available is unfit for drinking and they have to purify it before drinking.
27. In transport infrastructure, about one third (30 per cent) and half (52 per cent) people have cycles. It can be said that cycles and 2-wheelers are abundant in the system and cannot reach distant areas for services. Most people are dependent on public transportation system.
28. A huge investment is required for the construction of rural and urban roads. More than half (54 per cent) of the roads are kutcha and less than half (46 per cent) are pucca.
29. The study area does not have continuous power supply/ electricity in the system and the level and quality of electricity infrastructure needs to be improved.
30. Sewerage system is poor. The septic tank and soak-pits are more common in the system and very few households are connected to sewers.
31. In surface drainage, half of the people opined that there are overflows in the drains during the rainy season. Therefore, it needs adequate attention, otherwise there will be problem pertain to physical environment and deterioration in the system.
32. In waste management, the condition is rather more severe. About half (49 per cent) throw away their daily waste in the open and one third (33 per cent) burn it outdoors. The storage container and collecting facilities are worse. It shows that the waste management system is not healthy in this district.
33. Majority of the households are having agriculture operation and are confined among the lower income group.
34. The average land holding size of the district is 1.45 hectare. In this system, four fifth (80 per cent) of the total households have land holdings from 0-10 hectare.
35. Mixed cropping pattern is predominant among the surveyed households.
36. Paddy is the dominant crop grown in the region, followed by vegetables/cash crops, wheat, pulses and oilseeds.

37. The revenue incurred by the retailing of horticultural item is enormous and helps to earn foreign exchange. The major products are banana, mango, papaya, guava, peach, jackfruit, amla, pineapple, lemon, bamboo, bettlenut, etc.
38. There is no provision of irrigation by ponds, canal, drip etc. in the surveyed area. Irrigation is mostly rainfed followed by tubewells and river. With improved irrigation techniques, the production could have been increased.
39. Application of fertilizers are decreasing along with increase in income in the study area, which shows that the lowest income group with less land holding size, use more quantity of input in the system.
40. The total production of milk from the total surveyed area is 1100 litres per day, of which just 75 litres per day is consumed by the households. The milk surplus can be used properly and dairy factories can be put up in the system to commercialize the milk production.
41. In Tinsukia district, the milk supply is done by the milk man directly. There is no facility of district dairy where the daily milk can be packaged and circulated centrally.
42. Poultry business is a lucrative business in the North-east region. Here, more than four fifth (84 per cent) of the total earn from poultry and remaining one fifth (16 per cent) earn by rearing ducks, pigeons, swans etc.
43. Sericulture has become one of the most important cottage industries in Tinsukia district. Just 5 percent of the land under this activity ranges from 0-2 hectares. More than half (54 percent) area comes from 2-4 hectare and around two fifth (41 percent) of the total is spread over 4-6 hectares of land.
44. The surplus of raw silk is 605 kg per year that is sold to the handloom industries, cottage industries and wholesale markets for further processing. The total land area under sericulture is 24.17 hectares (as per primary data). The production of silk can be increased by increasing the rearing area and by introducing bio technically improved seeds for better yield.
45. The surplus from the fisheries is 26,900 kilogram per year. The first two income groups of 0-10,000 and 10,000-20,000 are mostly engaged in this activity. In most of the flourishing economies, households have their own land for this purpose which is absent in this system. Fishery activity can earn foreign exchanges if commercialized properly.

8.3 S.W.O.T. ANALYSIS AND VISION: The Strength-Weakness-Opportunity-Threat (SWOT) analysis of existing farming system (EFS) were carried out for Agriculture, Animal Husbandry, Fisheries and Sericulture sector in the district. The SWOT analysis for Agriculture and Horticulture has been done separately.

8.3.1 SWOT analysis of agriculture sector

Strength

1. Basic knowledge in cultivating agricultural crops.
2. Medium and low land with alluvial soil for cultivating paddy and other field crops.
3. Available of work force.
4. Existing of farmer groups having skill in processing activities.
5. Existence of marketing facilities and well developed road communication.
6. Awareness of farmers about IPM, INM and ITKs.
7. Low land suitable for paddy cultivation.
8. Plain topography helps in management practices.
9. Existence of Rice mills.
10. Extensive cultivation of paddy.

Weakness

1. Following traditional cultivation practices resulting reduced productivity.
2. Flood in rainy season resulting soil erosion, leading to nutrient leaching and siltation in crop field.
3. Low moisture retention and acidic nature of soil.
4. High humidity leading to occurrence of pests and diseases.
5. Water logging in low land.
6. Low and fluctuating rainfall leading to drought.
7. Fragmentation of land holding leading to large number of marginal and landless farmers.
8. Lack of group/ cooperative approach.
9. Under-employment in agriculture due to lack of commercial attitude.
10. Migration of labor force.

11. Lack of input supplying agencies.
12. Disorganized and lack of market and agro processing facilities.
13. Inadequate storage facilities.
14. Inadequate funding for different institutions and input supplying agencies.
15. Non application of IPM, INM and ITKs.
16. Non adoption of seed treatment, green manuring, imbalance chemical fertilization and poor water management.
17. Loss of soil organic matter and plant nutrient from soil.
18. Considerable yield gap due to technological gap in management.

Opportunities:

1. Promotion of organic farming.
2. Low incidence of pest and disease.
3. Scope for establishment of agro-based Processing units and cottage industries.
4. Diversified cultivation of wild species of pulses, oilseed and aromatic spices and medicinal plants.
5. Converting degraded hills slope under terrace rice cultivation
6. Improving productivity of crop through improved agronomic practices.
7. Higher market potentiality for organically produce crop.
8. Application of Post Harvest Technology, Bio-Technology and Information technology.
9. Integrated Watershed development.
10. Scope for pasture development.
11. Scope for afforestation and fodder cultivation on embankment.
12. Adoption of intensive paddy cum fish culture.
13. Scope for extension of NGO network.
14. Constitution of SHG federation at district level.
15. Establishment of processing units for production of rice based products for value addition.
16. Cultivation of appropriate varieties for processing of rice based products.
17. Organic production of paddy.

Threats:

1. Excessive rainfall causing flood, landslide and soil erosion.
2. Crop damage due to sudden outbreak of rodent population.
3. Fluctuation in market prices of Agricultural Produce and inputs.
4. Attacks of wild Elephant to Agricultural field and thus destroying the crops.
5. Increasing dependency on migratory labor.
6. Shrinkage of Agricultural land due to increase in human population.
7. Extensive Monocrop cultivation may lead to loss of bio-diversity.
8. Menace of stray cattle.
9. Improper practice and indiscriminate use of pesticides may lead to loss of biodiversity and health hazards.

8.3.2 SWOT analysis of Horticulture sector

Strength

1. Moderate rainfall, upland soil favoring horticultural crops.
2. Suitable soil PH leading to production of tasteful citrus fruits.
3. Organized farmers group available and existence of women self help groups.
4. Traditionally horticulture crop growers.
5. Well communicated market and well developed road communication facility.
6. Credit institution like commercial bank and input supplying agencies available at approachable distance.
7. Prevalence of orange, arecanut, betelvine, black pepper etc.

Weakness

1. Water logging due to improper drainage.
2. Flood situation and low and fluctuating rainfall leading to drought.
3. Fragmented land holding and predominance of land less and marginal land farmers.
4. Inadequate storage facilities.
5. Disorganized marketing.
6. Loss of organic matter and plant nutrients from soil.

7. Distress sale of products.

Opportunity

1. Expansion of area under banana, orange and coconut cultivation.
2. Labor intensive works.
3. Availability of family labor.
4. Development of existing village market and storage facilities.
5. Micro irrigation in fruit cultivation.

Threats

1. Erratic weather condition.
2. Diversion of agricultural land to non agricultural use.
3. Migration of agricultural labor.
4. Unhygienic way of living.
5. Procurement of seeds from outside the state and distress sale of products.

8.3.3 SWOT analysis of Animal husbandry and Veterinary

Strength

1. Tinsukia district has subtropical agro ecological zones which favors rearing of varied livestock species.
2. Monocrop cultivation practices resulting in growth of lush green succulent fodder in the field after harvesting of paddy favoring much cow, buffalo and goat rearing.
3. Dry upland soil causes decline in parasitic diseases favoring poultry and goat farming.
4. Swamp, Marshy land, water bodies favors fish farming and buffalo rearing.
5. Low lying land suitable for scavenging favoring piggery farming.
6. Organized farmers group available.
7. Existence of women SHG.
8. Traditional practices of livestock rearing.
9. Well developed road communication facilities.
10. Well communicated marketing nearby areas.
11. Credit institutions like commercial banks at approachable distance.

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12. Veterinary sub-centers and dispensary at approachable distance at Dholla, Margherita and Doomdooma.
13. Broiler and chicks, feed and medicinal dealers located at approachable distance
14. Rearing of mulch cow, buffalo, goat, poultry, duck and piggery.
15. Poultry, Duck and Pigs can be reared with fishes as a composite culture.
16. Cow-dung, buffalo-dung, Goat droppings, pig and poultry litters can be used as FYM.
17. Farmers are laborious and have traditional wisdom for livestock rearing.
18. High market demand for livestock products. Indigenous populations are non vegetarian.
19. Artificial insemination facility is available.

Weakness:

1. Grazing area remains submerged due to water logging.
2. Flood and drought like situation causing scarcity of fodders.
3. Alcoholism in male and females.
4. Pig rearing is a social taboo for some castes.
5. Engagement of child labor in animal husbandry works.
6. Superstitions.
7. Disorganized marketing of milk and exploitations by middleman.
8. Non-availability of processing unit for milk.
9. Concentrate feed is not provided which result in considerable gap in yield of milk, meat and egg.
10. Cross breeding programme is not fully adopted.
11. Traditional mindset and livestock are always considered as subsidiary income. They are reared on zero-input systems hence limiting their production capabilities.
12. Large numbers of indigenous livestock and poultry with poor productivity.
13. Non-availability of sufficient superior germ-plasma for replacement.
14. Lack of scientific know-how in livestock and poultry production system.
15. Weak veterinary healthcare services vaccine supply.
16. High production cost due to high feed cost (concentrate).
17. The concept of cultivation of fodder Crops for livestock is yet to adopt. Majority of the farmers perceive that livestock are reared on agricultural by products only.

18. The farmers are not farm centered; they have other options for earnings.
19. Inadequate credit support.
20. Insufficient marketing channels.
21. Non involvement of corporate sectors in livestock industries.
22. Artificial insemination facility is not installed.

Opportunities

1. Scope for developing fodder cultivation and dairy farming.
2. Restoration of fallow and barren land for pasture or grassland.
3. Skill up gradation of SHG (is engaged in an animal husbandry for farming, creating marketing channels and value addition in livestock products.
4. Establishment of mini milk and chilling plants.
5. Development of local market for sell of products.
6. Composite farming of poultry, duckery, broiler and piggery.
7. Scope of credit facility for commercial rearing of livestock in large units.
8. Introduction of commercial hybrid layer birds for egg production.
9. Gap in demand and supply.
10. Scope to improve productivity of huge indigenous livestock and poultry population.
11. Tapping huge natural resources to develop cheap locally available feed formulae for livestock and poultry.
12. Biotechnological applications for superior germ plasma conservation and propagation.
13. Available infrastructural facilities for obtaining training.
14. Export potentialities of the organically produced live stocks produces.

Threats

1. Occurrence of serious diseases of live stocks.
2. Increase prices of feed and other inputs.
3. Import threat from neighboring states/countries.

8.3.4 SWOT analysis of Fisheries sector

Strength:

1. Suitable land.
2. Traditionally involved in fish farming.
3. Available work force.
4. Marketing facilities.
5. Practice of medium input based composite fish culture.
6. Average water remaining period is 6-7 months.

Weakness

1. Non adoption of commercial fish farming.
2. Non availability of fish seed and feed.
3. Lack of fish seed nursery and proper rearing facilities.

Opportunities:

1. Increasing the height of embankments of fish ponds.
2. Motivating and convincing farmers for commercial fish farming.
3. Establishment of forward and backward linkage of seed, feed, fertilizer and marketing.
4. Paddy cum fish culture expansion.

Threats

1. Washout of fish seed during flood.

8.3.5 SWOT analysis of Sericulture sector

Strength:

1. Climate and land suitable for Eri food plants, silk worm rearing and Muga rearing.
2. Availability of work force.
3. Skilled man power.
4. Traditional practice.
5. Availability of adequate numbers of locally available rearing equipments.
6. Great demand for silk fabrics.

Weakness:

1. Insufficient silk worm food plants like 'Kesseru' and Castor.
2. Large number of landless and marginal farmers.
3. Non availability of scientific rearing, reeling equipments.
4. Non practice of scientific recommendations.

Opportunities:

1. Expansion of silk worm food plants cultivation.
2. Strengthening farmer's organizations.
3. Establishment of reeling and spinning units for producing silk yarn.
4. Motivation for improved cropping systems and rearing techniques.

Threats:

1. Pollution by pesticides spray in tea gardens affecting Eri, Silk and Muga rearing.

8.4 CONCLUSION: The investigator observed the above findings based on the primary analysis, exploration of literatures and field studies. The inferences of the same will be incorporated to evolve plausible policy guide lines for the integrated development of the system (Tinsukia District).

CHAPTER – 09

**RECOMMENDATIONS AND
CONCLUSIONS**

9.1 INTEGRATED PLANNING MODEL: The main aim of the model is to have uniform development in the whole district. This involves identification of the most suitable region to develop first. The Rurban areas are the best to develop by establishing the required quality of infrastructural facilities. This actually helps in relieving the pressure on the urban areas on one hand and enables the rural areas with more opportunities on the other.

1. **Central place theory** can be applied on the areas with the effective range of growth centres and growth channels, equal distribution of population/settlements and well connected settlements.
2. **Growth pole theory** can be applied to the areas, which are near to the growth centres. The reason of growth in these areas is the industrial development, which cannot appear everywhere at the same time and it also varies in intensity.

9.2 RECOMMENDATIONS: The following recommendations are evolved based on the survey, results, discussions with experts, and are presented sub-system wise for clarity:

9.2.1 Physical Subsystem:

1. The roads should be widened and those connecting service centres and villages should be well maintained.
2. Mixed traffic and heavy vehicles should be banned in the core area of the study area to avoid traffic congestion.
3. As per PMGSY, the rural roads shall be connected to all Habitations within a radius of 500 metres (1.5 km. of path distance in case of Hills. This “Cluster Approach” would enable provision of connectivity to a larger number of Habitations, particularly in the Hill / mountainous areas. The eligible “Unconnected Habitations” are to be connected to nearby Habitations already connected by an “All-weather road” or to another existing All-weather road so that services (educational, health, marketing facilities etc.), which are not available in the unconnected Habitation, become available to the residents. A “Core Network” of roads for all the blocks has to be formed by this programme.
4. Commercial activities from the core area should be relocated to the well planned areas to reduce congestion.

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5. Use of self-finance methods, such as, Transferable Development Rights (TDR), Additional Floor Space Index (FSI), Acquisition and Reservation (A & R), etc., should be used only to decongest the core area where land value is very high.
6. More number of trains should be introduced connecting various parts of the country directly to Tinsukia district for achieving better mobility of people and freight in the study area.
7. To achieve a balanced development in the system, the compact city and high-rise development concept shall be encouraged in urban fringes through amendment of existing Building Bye-Laws and Zoning regulations pertaining to the region.
8. The average land holding size of the district is 1.45 hectare, which engrosses various problems of tilling and ploughing. The novel concept of “Constituted Land Farming” can be incorporated in this region for better production and yield. This is in the lines of Green Revolution which has already been realized in the Northern states of Haryana and Punjab.
9. Promoting integrated townships in the suburbs for decongesting the accumulated population in the urban core, this in turn helps to achieve a balanced development in the study area.
10. There is an inevitable requirement for strong institutional mechanism for integrated development of the region. The Town and Country Planning Department has to initiate serious measures for evolving realistic regional development plan to achieve integrated development of the system.
11. The drinking water supply network has to be introduced in the study area. Centralized water purification systems have to be installed in the major towns to curb the problem of impure drinking water and channelized through pipelines to the entire network.
12. In the rural areas, under Accelerated Rural Water Supply (ARWSP), funds have to be provided to States for making provision of safe drinking water in rural habitations. 15% of these funds can be spent on operation and maintenance (O&M) of the existing drinking water systems and sources. To ensure lifeline sustainability in drinking water security under all circumstance and at all times, it may be required to have an alternate sub district, district and or state level water

supply system in the form of a grid supplying metered bulk water to GPs/village by adopting an appropriate system of pricing.

9.2.2 Social Subsystem

1. Social interaction can be increased by empowering the people of villages to run and maintain the services like drinking water facility, sewerage disposal, maintenance of streets, solid waste disposal, etc.
2. Plausible slum improvement and rehabilitation programs should be evolved and implemented on priority basis to improve the housing conditions.
3. It is an inevitable requirement for strong legislative measures to regularise the unauthorised development with requisite provisions of amenities and infrastructure services with imposition of fine and measures should be taken to control the same in future.
4. The panchayats can promote local talent by holding competitions in various sectors and awarding the people. This would also boost the confidence of the rural people to stand up and participate in the system.
5. Housing scheme should be implemented for slum dwellers, economically weaker section, and low-income group peoples, etc., on priority basis.
6. The huge gap of demand and supply of higher educational institutions should be catered at the earliest. Quality education can be provided by recruiting a good number of eligible faculties by the state government.
7. Well educated local people should be given preference for selection in rural officer posts as it would narrow down the communication gap between the administration and the local people.
8. Various training programs can be initiated by the administration to integrate traditional knowledge with modern techniques in every town and village to yield better results.
9. Public awareness programs and plays can be performed to increase the awareness among the masses regarding education, taboos, social evils, faulty customs and traditions.
10. Recreational and leisure activities should be developed to ease out mental stress of employees/labourers/staff working in Tea industry, Oil fields and Coal fields that have increased work duration.

11. Migration of skilled craftsman engaged in manufacturing world class fabric should be prevented by providing them with incentives and aids.
12. Increasing phase of in-migration for search of better education and employment opportunities has been observed, and hence there should be some check measures for in migration, which would be helpful to understand the population function in the study area.
13. Dairy factories can be put up in the system to commercialize the milk production. Packaging method can be adopted for distribution of milk which would reduce the dependence on milkman.

9.2.3 Economic Subsystem:

1. Co-operative farming should be introduced for farmers with small land holdings.
2. Proper guidance centres to be set up in the villages to make them aware of the possibilities and capabilities for setting up small scale and cottage industries.
3. Employment can be generated by involving youth and women of the rural areas in industries and in the urban areas, they can be given vocational education and cottage industries can be promoted.
4. The public construction of health centres, public schools, panchayats bhawan, storage facilities etc. should be given to the towns/villages itself to generate employment.
5. The HYV seeds for sericulture should be introduced to multiply the sericulture production and the disintegrated lands should be brought under one umbrella to draw maximum benefit of better yield in large fields.
6. Textiles are the traditional business of Silk, and specialized skilled manpower is also available in this regard. Fabric produced is of the highest quality with promising demand in the overseas market, till today.
7. Fishery business is very common in this region, but it hasn't been tapped fully. Building of ponds should be encouraged in the barren or unused or backyard lands.
8. Eco-Tourism can be promoted in region by showcasing the cultural richness, bio – diversity parks, wildlife reserves and natural beauty of the district. This will create new growth centres and provide employment opportunities to the people of the study area.

9. Food processing, floriculture ventures like cut flowers and for cultivating medicinal and aromatic plants have huge amount of potential in this region. Feasibility studies have to be undertaken to strengthening this industry and the unemployed youths may be given adequate training and employ them in the same, which in turn, not only strengthen the agro industry, but also considerably reduce the unemployment problems in the region.
10. The small scale industry (SSI) is the major growth parameter of the rural employment. The scientific and proper implementation of SSI can achieve the ultimate solution of rural economic backwardness.
11. The banks may prepare Area Development schemes for Inland Fisheries with the help of NABARD as lot of potential is available in the district.
12. Tinsukia district records the highest tea productivity level of 2,663 kg/ha and stands out in the horticultural activities within the state. Government may encourage private entrepreneurs for establishment of cold storage/cool chain/ processing/ grading/ packaging units ensuring quality to make a brand of the state.
13. Technical service support may be given to small tea growers in respect of quality control to maintain goodwill of Assam Tea in international market thereby boosting economy of the district as well of the nation.
14. Bamboo plantation in the district supports the rural and urban economy and ecology to a great extent. It is considered by Government of India as a “Developmental Tool” and National Mission on Bamboo Technology has been launched with the aim to generate employment, income opportunities and ensure ecological security. It is therefore necessary to develop a Public Private Partnership (PPP) and provide the credit support for Bamboo plantations.

9.2.4 Infrastructural Subsystem:

1. The study area is blessed with high rainfall, and the water supply requirement of this entire region is met through ground water source. Public water supply system needs to be incorporated in the system by the municipal bodies to distribute and maintain the quality of water.
2. There is an urgent need for improvement in the sanitation network coverage of the district as it poses serious threat to the environment and marine ecosystem

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- near the river banks. Further, it is essential to take up necessary steps for recycling of waste water.
3. Most of the solid waste in Tinsukia district is dumped in the open ground unscientifically. Further, there is irregular collection is observed at the household level. It is suggested that private participation should be encouraged at all stages of solid waste management, i.e., for collection, storage, transportation, and finally recycling and dumping of waste.
 4. Suitable Landfill site must be identified in the study area, for scientific disposal of solid waste on land without creating nuisance or hazards to public health or safety and the same should be engineered construction.
 5. Burning of solid waste in an open dumping ground should be avoided. The solid waste open dumping place should be situated in an appropriate site which may not interfere with the developmental activities, deteriorating the district's environment, and paving the ways for spreading diseases.
 6. Tinsukia lacks in effective drainage system, most of the existing drains need repairs and there is an urgent need to increase the network coverage for effective drainage of the city. The drainage system of the city should be integrated with existing surface water bodies in order to harness the rain water.
 7. Public transportation should be strengthened in the district. The frequency of intercity trains and number of buses should be increased.
 8. The problem of electricity can be reduced by adoption of alternate energy system like "Solar energy", "Hydro energy" and "Wind energy" by installing photo voltaic lighting system for street lighting, mini hydro electricity plants within few agglomerations by tapping the water of mighty Brahmaputra and establishing wind mills near river banks to cater the power requirement of agricultural fields respectively. This work has to be initiated by Village Energy Security Programmes (VESP) at the rural level making the villages self sufficient in energy.
 9. There is tremendous potential for installing "Biogas Plants" within villages and using it as an alternative energy source.

10. There is a good scope for establishing Bio – Fuel plants, like “Jatropha” and converting the uprooted tea gardens to produce environment friendly fuel, which can suffice the energy requirement of that particular Tea Estate.
11. The inland waterways system can be remodelled and reinstalled for the transportation and commutation of people, freight and vehicles. The inland waterways system can reduce the load on road transportation system and would also pose as a better alternative of public transport.
12. Adequate arrangements for marketing, preservation, processing, multi-chamber cold storages facilities have to be provided to the farmers to improve the infrastructural condition of the district.

9.2.5 Environmental Subsystem:

1. Measures should be adopted for protection and conservation of natural water bodies, forests, historical sites, architectural sites, etc., in the study area.
2. People should make aware of the benefits of tree plantation, use of bio fertilizers, etc. and use of HYV seeds should be promoted.
3. Afforestation policies are to be adopted, and afforestation should be done with local people’s participation.
4. Social forestry serves both the environment and the minor fruit production along with timber yielding planting process. The waste land development can be achieved its active participation.

9.2.6 Ecological Subsystem:

1. Soil fertility can be improved by the reduced use of fertilizers and pesticides, rather bio - fertilizers are wise substitute.
2. Ground water resources can be recharged by implementing “Rain Water Harvesting systems” and afforestation programs. Instead of hand pumps, community well systems can be imparted to reduce water wastage. This would also encourage community feeling and social interaction.
3. All the water bodies, ponds, lakes, etc. can be retrieved from all kinds of pollution, and can be used as water base tourism by maintaining its ecological balance in the system.
4. To achieve a balanced ecosystem, feasible development plan pertaining to ecology and environment of the study area shall be evolved and implemented by

considering the existing features in the system along with total development of the system.

9.2.7 Institutional Subsystem:

1. To improve the transparency in the Panchayati Raj System, 73rd and 74th Constitutional Amendment Act must be implemented strictly in the district.
2. The responsibilities and duties should be shared. This should follow the trickle down method at every level of administration. Only the funding and supervision work should be handled by the Government.
3. A policy decision by the government is needed to involve and integrate bank finance with the available budgetary support so as to enable coverage of more area for works like land levelling, reclamation, gully plugging and terracing etc.
4. The compulsory learning of English language, the schools and colleges should have English as the medium of examination conduct. This will help the people of the district to become more competent and participation quotient will shoot up.
5. To improve the education level in the district, a minimum standard should be set up irrespective of the caste, creed, tribe, etc. which will qualify the people for government jobs and the reservations/benefits to be given on the number of headcount of the family and not on caste basis.
6. Adult education centres and night school facilities should be provided in each and every village and towns to uplift the illiterate and increase the level of education.
7. RRBs/ CBs may consider opening of their branch in unbanked villages/areas.

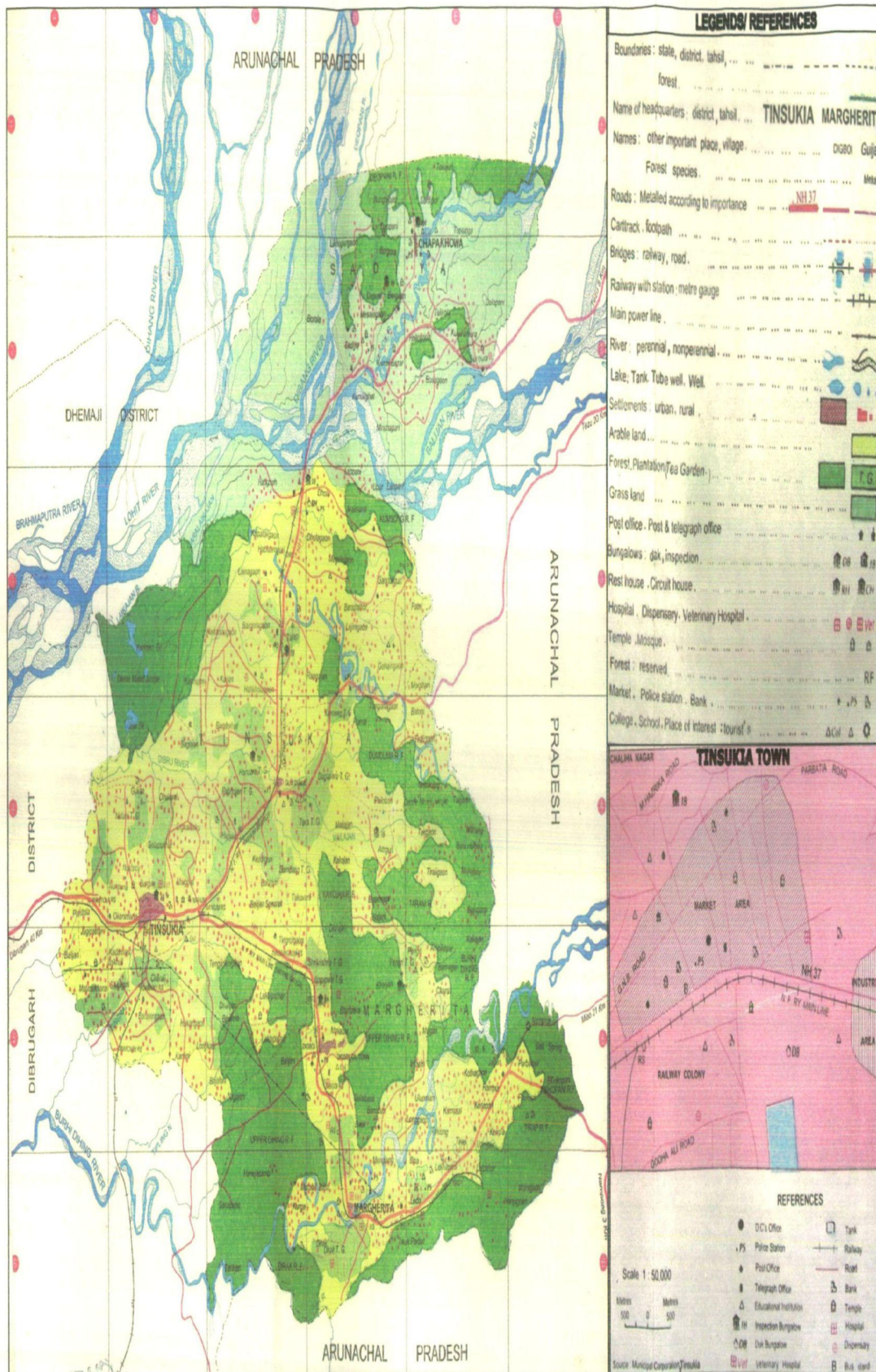


Figure 9.02: Map of Tinsukia District showing Administrative Boundaries, Infrastructural facilities, settlements and Forest Lands

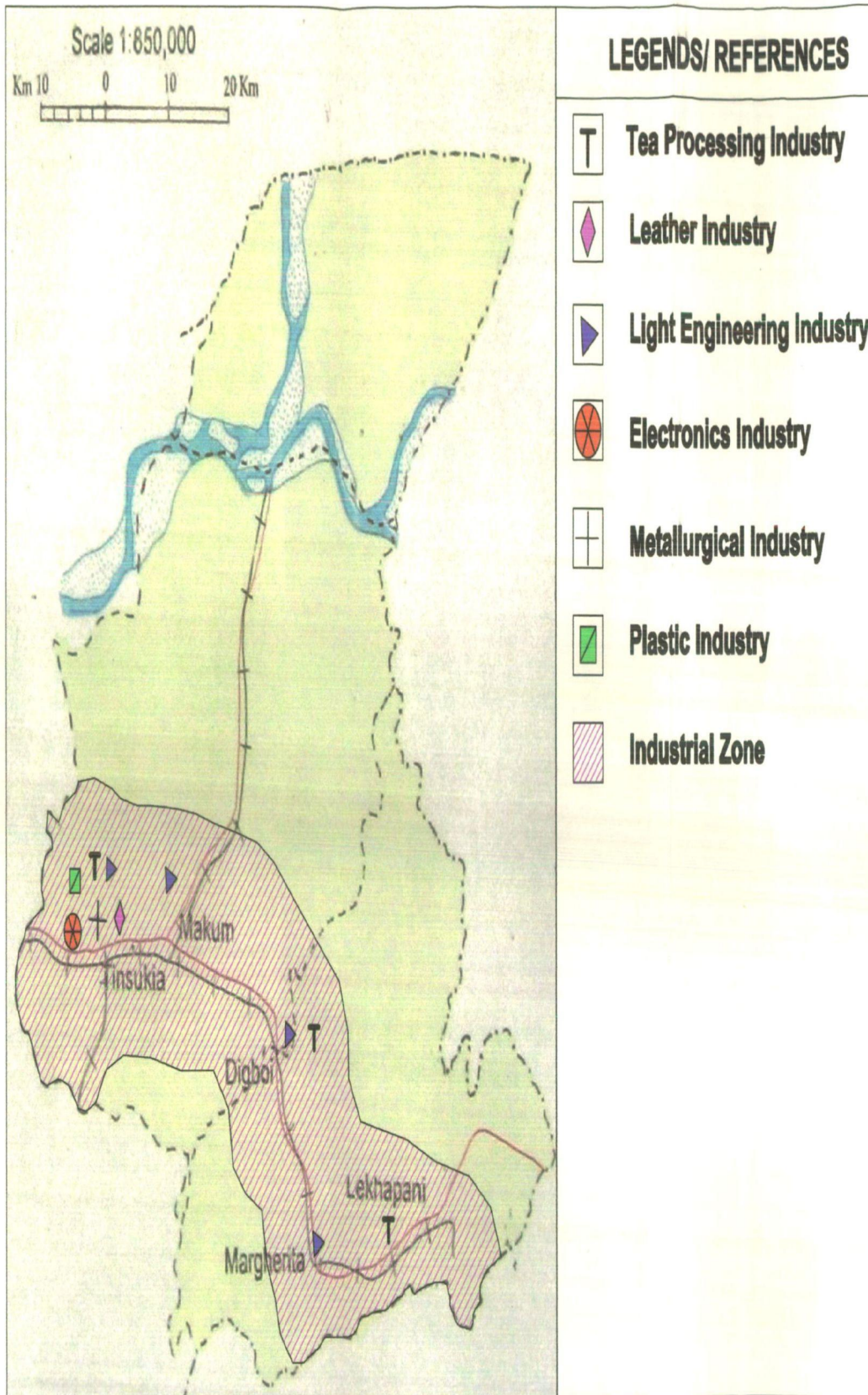


Figure 9.03: Location of Existing Industrial Estates and Demarcation of Industrial Zone

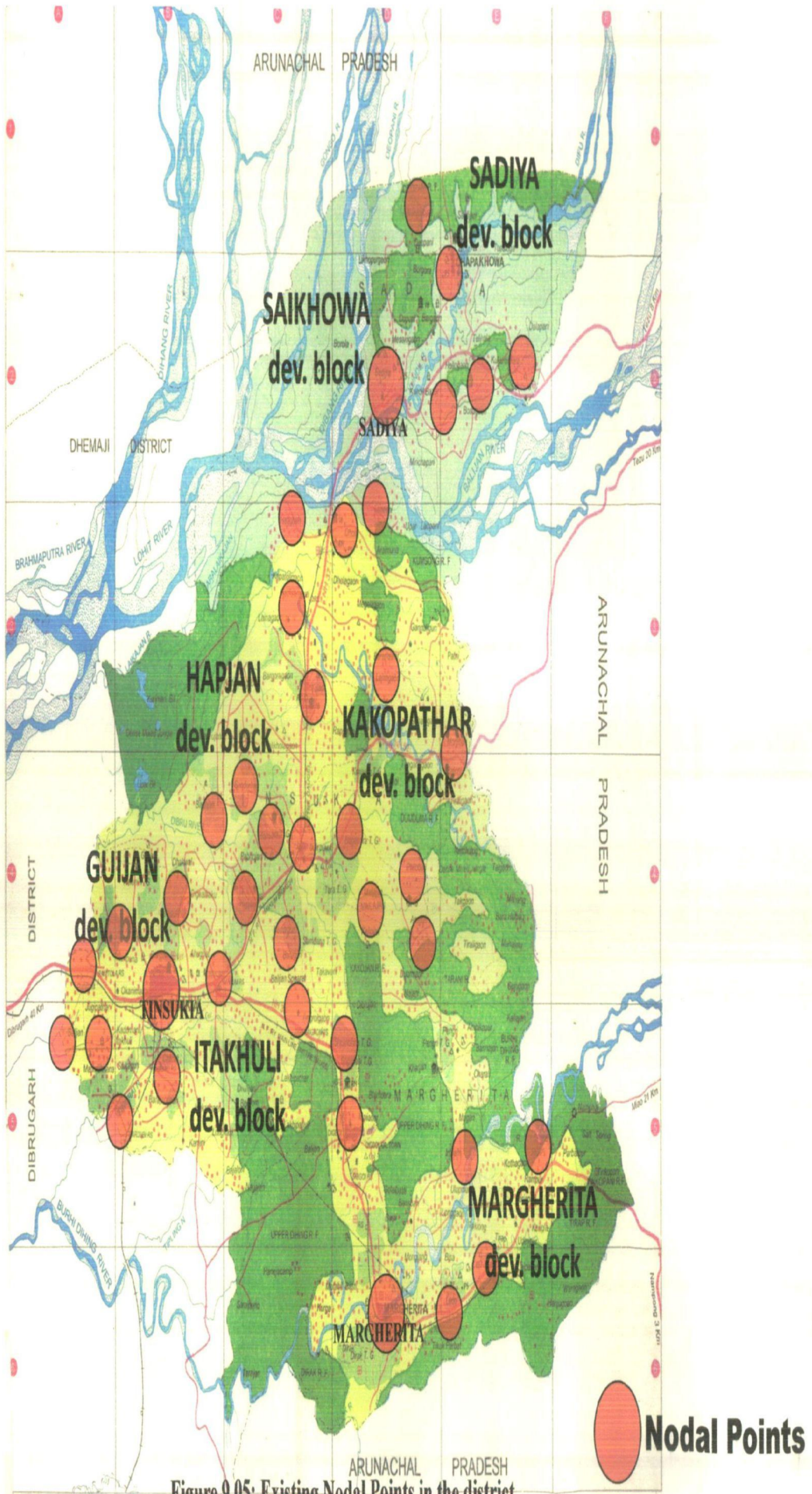


Figure 9.05: Existing Nodal Points in the district

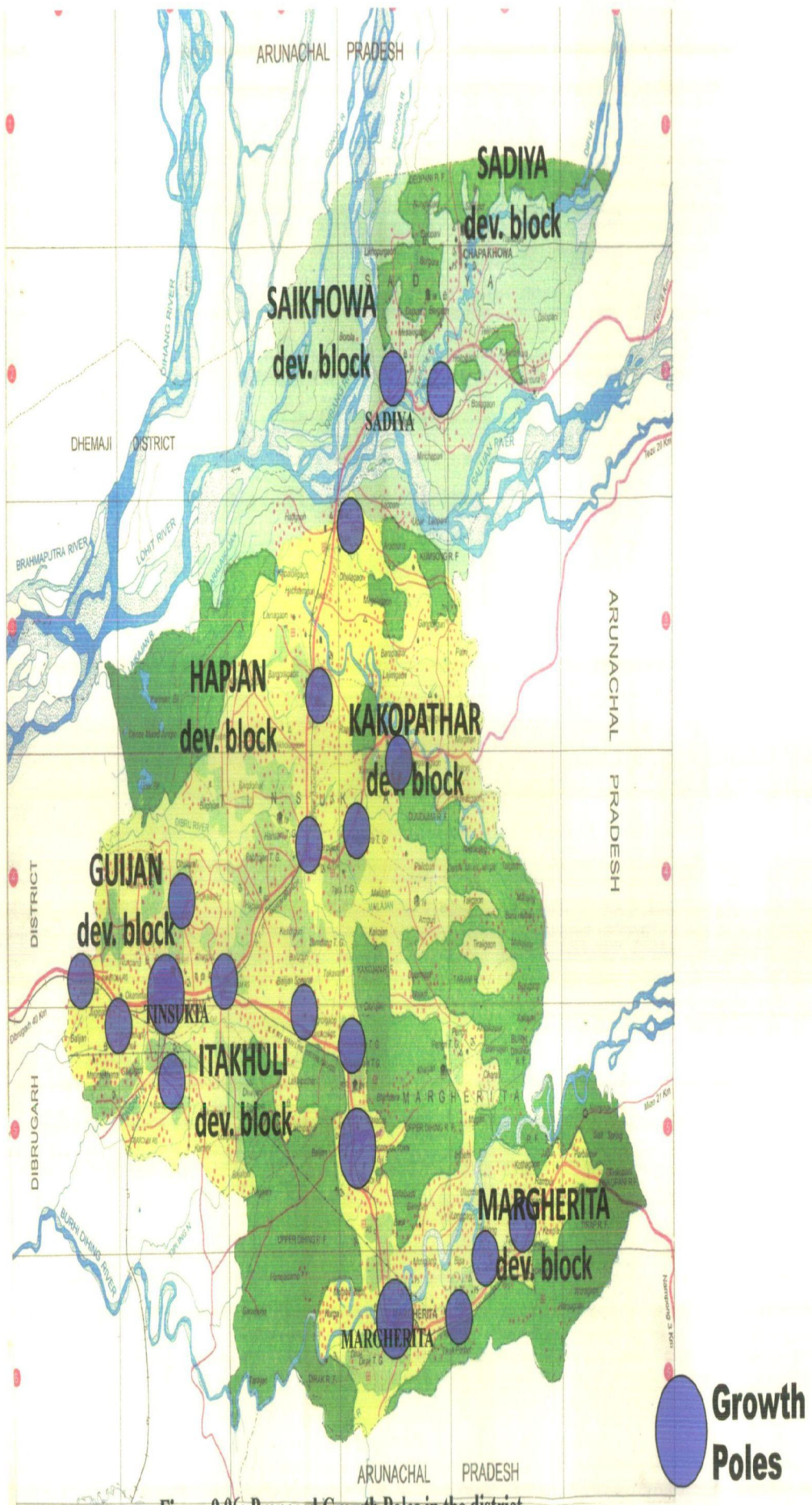


Figure 9.06: Proposed Growth Poles in the district

9.4 CONCLUSION:

The prime objective of a realistic urban development plan is achieving integrated development in a particular system, for which the plan is evolved. This requires plausible policy guidelines and feasible plan for which thorough grassroots level investigation is essential. The available literature in the field of urban development reveals that several studies were attempted to develop plan at sectoral level, but not at integrated level, without understanding the interactions and interrelationships amongst various components of the urban system.

In this present investigation, an attempt was made to evolve plausible policy recommendations for the integrated development in a system (Tinsukia District) by considering the most important control parameters, which decides the functions of the system. It is observed that although steps are being taken by the Government for the development of the same in the system, lack of comprehensive plan and integrated approach becomes a deterrent in the development process. Therefore, the Investigator conducted primary household survey at the grassroots level and exploration of available literature, to understand the physical, socio-economic and environmental conditions, level of infrastructure facilities, which influence the total development of the system. An attempt has been made to develop conceptualized urban system model by considering various subsystems and their controlling parameters obtained from the analysis to evolve plausible policy recommendations for integrated development of the study area.

Further, System theory, Centre Place theory, Growth pole theory and Polarized Regional concept have been employed in this investigation. Projections are done by employing suitable statistical techniques for forecasting the demand and supply of infrastructure in the system for the year 2031 A.D. Finally, a set of plausible policy recommendations are evolved for achieving integrated development of the system. The study concludes that if the recommended policies are considered and optimal, feasible, and viable schemes are developed based on the recommended policies and implemented in time, with statutory backing vibrant integrated development will be achieved in the system.

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Proforma no:

Surveyed by:.....

1. **Name of the village:**
2. **Name of the block:**
3. **Name of the tehsil:**
4. **Name of the district:**
5. **Civic status: notified area committee / nyay panchayat / gram sabha / revenue village**
6. **Area:**
7. **Household size:.....Male:.....Female:.....**
8. **Name of the family head:**

9. **Address:.....**
10. **Religion.....**
11. **Caste:.....**

Sl no.	Name of persons	Relation with family head	Age (yrs)	Married (yes/no)	Maximum education attained	Monthly income	Primary occupation	secondary occupation
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

5. Monthly expenditure(in Rs):

- | | |
|---------------|-------------------|
| a. Food | e. Clothes |
| b. Education | f. Transportation |
| c. Recreation | g. Loan repayment |
| d. Health | h. Any other |

6. Energy(in Qty.):

- | | |
|----------------|-------------|
| a. Fuel wood | b. Charcoal |
| c. Kerosene | d. Diesel |
| e. Petrol | f. LPG |
| g. Electricity | h. Bio-gas |

i. fodder

j. fertilizers

i. Cow-dung cakes

j. crop residue

7. Household appliances:

Refrigerator....., TV....., AC....., Stove....., Cooler....., Mixer/grinder....., Geyser.....,

Computer....., Washing Machine....., Pressure cooker....., Phone(Landline)....., Mobile, Other.....

8. Housing:

• Type of house:

Pucca / Semi pucca / kutcha

• Water supply.....

• Latrine.....

• Bath.....

• Electricity.....

• Sewerage.....

• Drainage.....

• Garbage.....

• Age of the house (yrs):

• Physical condition: good / livable / dilapidated

Ownership: rented / owned / othe

• Nos of rooms:..... nos of floors.....

Finance : bank / self / ancestral /

other

• Service available: bathroom.....toilet.....

9. Water supply:

Sources:.....Storage..... availability.....duration of water supply (in hours)..... quality of water.....

10. Irrigation & agriculture:

Land holding:

Fallow land:

• Total land ownership

• Net income from cultivation (in Rs.)

• Cropping Pattern:

Sl. No.	Name of the crop	Kharif Crop (Area in ha.)	Rabi Crop (Area in ha.)	Summer Crop (Area in ha.)	Total (Area in ha.)
1.	Wheat				
2.	Maize				
3.	Paddy				
4.	Sugarcane				
5.	Oil seeds				

6.	Pulses				
7.	Forage crops				
8.	Vegetables				
9.	Spices				

• **Horticulture:**

S. No.	Name of the crop	No. of Trees	Total (Area in ha.)	Output (Unit)
1.	Banana			
2.	Mango			
3.	Guava			
4.	Jackfruits			
5.	Litchi			
6.	Peach			
7.	Plum			
8.	Amla			
9.	Neem			

Any Other Crop:.....

• **Sources of irrigation:**

S. No.	Source	Kharif Crop (Area in ha.)	Rabi Crop (Area in ha.)	Summer Crop (Area in ha.)	Total (Area in ha.)
1	Canal				
2	Pond				
3	River				
4	Tube well				
5	Rainfed				

Farm output from cultivations in kilograms

S. No.	Output	Kharif Crop (qt. in kg)		Rabi Crop (qt. in kg)		Summer Crop (qt. in kg)		Total Crop (qt. in kg)	
		Major Prdct.	By Product	Major Prdct.	By Product	Major Prdct.	By Product	Major Prdct.	By Product
1	Total output								
2	Sold Out								
3	Consumed								

Livestock

S. No.	Name of Animal	Nos.	Milk(Ltrs)	Dung(unit)	Meat (Kg)	Wool(Kg)	Input (Livestock)
			Total & Consumed	Total & Consumed	Total & Consumed	Total & Consumed	
1	Cow						
2	Buffalo						
3	Bull/ Ox						
4	Mule						

5	Horse						
6	Sheet/Goat						
7	Poultry						
8	Birds						
9	Other Specify						

Distance travelled to the market.....
mode of transport.....expenditure in one season.....
Bovine population:.....

11. Power/ energy supply:

Source.....duration of power cuts.....metered / non metered.....monthly
tariff.....transformer.....substation availability..... Voltage fluctuation.....

12. Transport facilities:

- Condition of road: kachha / pucca Maintenance of the road: good / bad / worse / not any
- Modes of transport: cycle.....2-wheeler.....4-wheeler.....public transport.....
- trips for different purposes in a day:
educational.....health.....occupational.....recreational.....administrative works.....
- time for various trips to avail certain facilities:
educational.....health.....occupational.....recreational.....administrative works.....
- Distance travelled for various trips to avail certain facilities:
educational.....health.....occupational.....recreational.....administrative works.....
- Nearby large villages / urban settlements:
- connectivity to surrounding villages and urban settlements:.....
- nearest railway station:.....Distance travelled to reach the railway station:.....
- nearest bus station:.....Distance travelled to reach the bus station:.....

12. Financial Institutions:

Sr. No.	Name of Bank	Type(Co-operative/Private/RRBs)

Any other private money lending agencies/ Individuals:

13. Educational facilities:

- total no. of educational institutes.....
- level and number of institutes: primary:..... / secondary:..... / higher secondary:..... / other:.....
- level of education: satisfactory / unsatisfactory
- vocational training institutes if any.....

- Anganwari.....
- social welfare programs.....

14. Medical Facilities :

Nos of Primary health care centre.....distance.....level of service: satisfactory / unsatisfactory
 Nos of govt. Hospital.....distance.....level of service: satisfactory / unsatisfactory
 Nos of nursing homedistance.....level of service: satisfactory / unsatisfactory
 Nos of medical shops.....distance.....

15. Community facilities:

religious places.....open grounds for fairs.....baratghar.....entertainment facility.....gymnasium.....

16. Industries :

Sl. No.	Type of Industry	Raw material utilized	Net output	Byproduct pollutant	Investment Per annum	Expenditure per annum
	Agro Based					
1	Food based					
2	Rice/Flour mill					
3	Sugar mill					
	Oil Extracting					
1	Ground nut					
2	Mustard					
3	Cotton					
	Food Processing					
1	Mango					
2	Lemon					
3	Other					
	Forest based					
1	Handmade paper					
2	Card board					
3	Plywood					
4	Saw mill					
5	Wooden works					
6	Turpentine oil					
7	Neem oil					
	Medicinal plants					
	Livestock based					

1	Dairy					
2	Woolens					
3	Carpets					
4	Blankets					
5	Feather					
	<u>Demand based</u>					
1	Gen. Engg.					
2	Agri. Implements					
3	Cycle rick parts					
4	Washing soap					
5	Stone crusher					
6	Stone Polishing					
7	Brick kilns					
8	Dwg survey instru					
9	Electronics					
10	Canning & fruits					

cottage industries.....food processing.....rice mill.....stone crusher.....sug mill.....

any other agro-industries.....

sericulture:.....,tie n dye industry of clothing....., weaving.....,dai products.....

any other industry based on the products or by-products of live-stock/agrarian products.....

scale of industries:.....

17. Drainage / sewerage:

- Availability of : septic tank / sewer line / no facility
- Drains: open / covered / no drains
- Problems: overflow/ clogging / bad odour / no problems
- Over flow in rainy seasons: yes / no

18. Waste disposal:

- Method of collection at house: storage container / dust bin / polythene bags / burning / throwing out
- Frequency of collection: everyday / alternate day / 3 days / 5 days / weekly / none
- Agency of collection: panchayat / private agency
- Charged / non charged

19. Social welfare schemes undertaken by the GOI or any other authority:

Names of the schemes:.....

Sources of funding:.....

The benefitted population

20. **Remarks:**

List of infrastructure expected of the village in the panchayat level

1. Panchayat Ghar.....
2. Bus Stand/ Shelter.....
3. Commercial Center/ Barat Ghar.....
4. Anganwari Bhawan.....
5. Primary School.....
6. Secondary School.....
7. Higher Secondary School.....
8. Dispensary/ ANM Centre.....
9. Vetenary Development Centre (Infrastructure)
10. Drainage/ Nala.....
11. Public Toilets.....
12. Hand Pumps.....
13. Pipeline/ Tank.....
14. Ponds (Water Body) Hauj.....
15. Tube/ Open Well.....
16. Check Dam.....
17. Gool/ Nali.....
18. Internal Roads (Cc/ Charcoal)
19. Pulia/ Bridge.....
20. Individual/ Common/ Horticulture/ Social Forestry Development.....
21. Telecommunication.....
22. Post Office/ Boxes.....
23. Shops (Types)

Proposed works

1. Water Resource Structure.....
2. Construction Of Pulia,
3. Tanks,
4. Toilets.....
5. Panchayat Ghars/ Comm. Centres.....
6. Connecting Roads.....
7. Pathshala Bhawan.....
8. Drinking Water Pipeline.....
9. Check Dam.....
10. Stop Dam.....
11. Anganwari Bhawan.....

12. Gool.....
13. Irrigation.....
14. Manoranjan Kendra.....
15. Health Facilities.....
16. Fish Ponds.....
17. Kharauja.....
18. Flood Control Works.....
19. Social Forestry.....
20. Land Development Works.....

Proforma no:

Surveyed by:.....

1. Name of the village:
2. Name of the block:
3. Name of the tehsil:
4. Name of the district:
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6. Area:
7. Household size:.....Male:.....Female:.....
8. Name of the family head:

9. Address:.....
10. Religion.....
11. Caste:.....

Sl no.	Name of persons	Relation with family head	Age (yrs)	Married (yes/no)	Maximum education attained	Monthly income	Primary occupation	secondary occupation
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5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

5. Monthly expenditure(in Rs):

- | | |
|---------------|-------------------|
| a. Food | e. Clothes |
| b. Education | f. Transportation |
| c. Recreation | g. Loan repayment |
| d. Health | h. Any other |

6. Energy(in Qty.):

- | | |
|----------------|-------------|
| a. Fuel wood | b. Charcoal |
| c. Kerosene | d. Diesel |
| e. Petrol | f. LPG |
| g. Electricity | h. Bio-gas |

5	Horse						
6	Sheep/Goat						
7	Poultry						
8	Birds						
9	Other Specify						

Distance travelled to the market.....
mode of transport.....expenditure in one season.....
Bovine population:.....

11. Power/ energy supply:

Source.....duration of power cuts.....metered / non metered.....monthly tariff.....transformer.....substation availability..... Voltage fluctuation.....

12. Transport facilities:

- Condition of road: kachha / pucca Maintenance of the road: good / bad / worse / not any
- Modes of transport: cycle.....2-wheeler.....4-wheeler.....public transport.....
- trips for different purposes in a day:
educational.....health.....occupational.....recreational.....administrative works.....
- time for various trips to avail certain facilities:
educational.....health.....occupational.....recreational.....administrative works.....
- Distance travelled for various trips to avail certain facilities:
educational.....health.....occupational.....recreational.....administrative works.....
- Nearby large villages / urban settlements:
- connectivity to surrounding villages and urban settlements:.....
- nearest railway station:.....Distance travelled to reach the railway station:.....
- nearest bus station:.....Distance travelled to reach the bus station:.....

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Any other private money lending agencies/ Individuals:

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- level and number of institutes: primary:..... / secondary:..... / higher secondary:..... / other:.....
- level of education: satisfactory / unsatisfactory
- vocational training institutes if any.....

- Anganwari.....
- social welfare programs.....

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Nos of Primary health care centre.....distance.....level of service: satisfactory / unsatisfactory
 Nos of govt. Hospital.....distance.....level of service: satisfactory / unsatisfactory
 Nos of nursing homedistance.....level of service: satisfactory / unsatisfactory
 Nos of medical shops.....distance.....

15. **Community facilities:**

religious places.....open grounds for fairs.....baratghar.....entertainment facility.....gymnasium.....

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3	Sugar mill					
	Oil Extracting					
1	Ground nut					
2	Mustard					
3	Cotton					
	Food Processing					
1	Mango					
2	Lemon					
3	Other					
	Forest based					
1	Handmade paper					
2	Card board					
3	Plywood					
4	Saw mill					
5	Wooden works					
6	Turpentine oil					
7	Neem oil					
	Medicinal plants					
	Livestock based					

1	Dairy					
2	Woolens					
3	Carpets					
4	Blankets					
5	Feather					
	<u>Demand based</u>					
1	Gen. Engg.					
2	Agri. Implements					
3	Cycle rick parts					
4	Washing soap					
5	Stone crusher					
6	Stone Polishing					
7	Brick kilns					
8	Dwg survey instru					
9	Electronics					
10	Canning & fruits					

cottage industries.....food processing.....rice mill.....stone crusher.....sug mill.....

any other agro-industries.....

sericulture:.....,tie n dye industry of clothing....., weaving.....,dai products.....

any other industry based on the products or by-products of live-stock/agrarian products.....

scale of industries:.....

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- Charged / non charged

19. Social welfare schemes undertaken by the GOI or any other authority:

Names of the schemes:.....

Sources of funding:.....

The benefitted population

20. **Remarks:**

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3. Commercial Center/ Barat Ghar.....
4. Anganwari Bhawan.....
5. Primary School.....
6. Secondary School.....
7. Higher Secondary School.....
8. Dispensary/ ANM Centre.....
9. Veterinary Development Centre (Infrastructure)
10. Drainage/ Nala.....
11. Public Toilets.....
12. Hand Pumps.....
13. Pipeline/ Tank.....
14. Ponds (Water Body) Hauj.....
15. Tube/ Open Well.....
16. Check Dam.....
17. Gool/ Nali.....
18. Internal Roads (Cc/ Charcoal)
19. Pulia/ Bridge.....
20. Individual/ Common/ Horticulture/ Social Forestry Development.....
21. Telecommunication.....
22. Post Office/ Boxes.....
23. Shops (Types)

Proposed works

1. Water Resource Structure.....
2. Construction Of Pulia,
3. Tanks,
4. Toilets.....
5. Panchayat Ghars/ Comm. Centres.....
6. Connecting Roads.....
7. Pathshala Bhawan.....
8. Drinking Water Pipeline.....
9. Check Dam.....
10. Stop Dam.....
11. Anganwari Bhawan.....

12. Gool.....
13. Irrigation.....
14. Manoranjan Kendra.....
15. Health Facilities.....
16. Fish Ponds.....
17. Kharauja.....
18. Flood Control Works.....
19. Social Forestry.....
20. Land Development Works.....

