



GRAM PANCHAYAT SPATIAL DEVELOPMENT PLAN

SARAIGHAT GAON PANCHAYAT

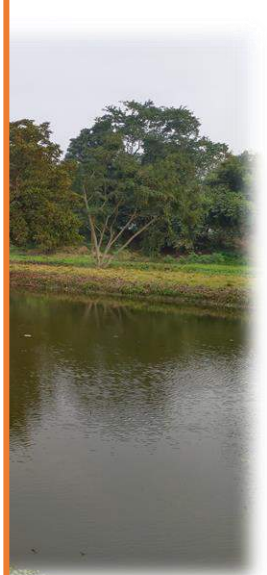


MINISTRY OF PANCHAYATI RAJ,
GOVERNMENT OF INDIA



PREPARED BY
INDIAN INSTITUTE OF TECHNOLOGY
GUWAHATI

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EXECUTIVE SUMMARY

The Panchayats constitute the third tier of government in rural areas. They have been specifically mandated by Article 243G of the Constitution for planning for economic development and social justice within their respective regions. However, in their current setup, the Panchayats neither have the means nor the capacity to undertake such an effort. In order to do any meaningful planning for economic development within their geographical jurisdiction, it is essential for the panchayats to envision and correlate economic development with land use classification, both present and for the future. The land is the most important natural resource, which is indispensable for development activities and for meeting the social, economic, and ecological requirements and aspirations of the people.

Spatial plans are prepared for cities and towns, popularly known as Master Plans and Development Plans, and notified under the respective State Town and Country Planning Acts(T&CP). But there is no provision for preparing Master/ Development Plans for countryside villages, and no serious attempt has been made to prepare Spatial Plans for rural areas for holistic growth and development. Herein lies the importance of preparing a spatially integrated development plan for the rural areas considering the vast rural population of the country who have been deprived of access to basic facilities.

The Spatial Development Plan using the latest Geographical Information System (GIS) technology would be an internal component of the Master Plan to promote growth and guide and regulate present and future development of Rural Areas with a perspective of 20-25 years under the overall supervision of Panchayati Raj Institutions.

Indian states have legislative frameworks in place for spatio-economic planning of urban areas. However, when it comes to rural areas, there is lack of integration of spatial aspects in development plans. In 2016, Ministry of Panchayati Raj came up with the Rural Area Development and Plan Formulation and Implementation (RADPFI) Guidelines. This exercise is to verify its applicability at the ground level. The 73rd amendment to the Constitution of India has paved the way for democratic governance in rural areas. Taking it further ahead the XIV Finance Commission award has created an opportunity for responsive local governance at Gram Panchayat level through Gram Panchayat Development Plan (GPDP), that are to be prepared by the Gram Panchayats incorporating the functions devolved to them as per state Panchayat Acts. Herein lies the importance of preparing a template for a spatially integrated version of the GPDP, namely the GPSDP (Gram Panchayat Spatial Development Plan).

However, it has to be noted that GPSDP is not a separate plan but an integrated plan along with GPDP but for a long-term perspective.

The Ministry of Panchayati Raj has assigned the task of preparing a model GPSDP to Indian Institute of Technology Guwahati. The Gram Panchayat chosen for this demonstration project is Saraighat GP situated in Bezera block, Kamrup District, Assam. It is located at a distance of 40 km from the Guwahati city. The geographical area is 20.19 sq. km. Total number of households are 1886 and total population of the GP is 16000 at present.

The GPSDP incorporates the spatial layers corresponding to attributes like physical Infrastructure, Social Infrastructure, land use in Abadi area, Agriculture, overall land and Water Management plan etc. Panchayat members through Panchayat meetings verified the spatial proposals made by the team. This made this spatial plan at the village plan a participatory plan. The project also emphasis on future land and water management plan with respect to recent one. A twenty years phasing vision plan has also been prepared for the proposed interventions. This is call for action and the MoPR has taken up the task at the right time.

VISION

“Sustainable development of the Nation’s Soul, that is the village, with holistic spatial planning with appropriate technological intervention and promotion with a human touch as a driver of solutions”

OBJECTIVES

The main objectives of the study are as follows:

1. Creation of **resource information system for sustainable development** at Gram Panchayat level using spatial planning.
2. To propose a **holistic and sustainable development program** and planning to enhance present situation of Gram Panchayat.
3. To propose a **sustainable land and water management plan** for creating framework for future policy decisions.
4. To suggest the **remedial development measurement** at Gram Panchayat level considering land and water resources for optimal utilization on a sustainable basis.

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Study Team

CHAPTER 1

INTRODUCTION

The concept of spatial planning deals with the integration of various physical, social and economic functions over space. Such integration is achieved by planned action over time and brings about balanced regional development. The basic objective of such spatial planning is to distribute the benefits of development among the maximum number of people and to minimize the regional disparities in levels of development. The centralized planning undertaken by the developing countries for economic development has the advantage that the central government has supreme command over the material resources of the country. It attempts to achieve inter-sectoral consistency with set input-output relationships and sets its targeted rates of sectoral and overall growth of the economy.

1.1 Importance of Spatial Planning in the Development of Gram Panchayat:

Spatial plans are prepared for cities and towns, popularly known as Master Plans and Development Plans, would be an overarching planning document that sets out how a particular area/ location in the Panchayat can (as opposed to will) develop and redevelop into the future. But there is no provision for preparing Master/ Development Plans for countryside villages, and no serious attempt has been made to prepare Spatial Plans for rural areas for holistic growth and development.

The Master Development Plan needs to clearly identify land and infrastructure usage requirements for the GP, which includes land allocation & usage, provisioning of infrastructure services, creating economically productive, efficient, and equitable rural growth centers resulting in a balanced and sustainable distribution of activities, so that the Panchayats/ Rural Areas can perform all their economic and social functions efficiently and effectively.

The Spatial Development Plan using the latest Geographical Information System (GIS) technology would be an internal component of the Master Plan to promote growth and guide and regulate present and future development of Rural Areas with a perspective of 20-25 years under the overall supervision of Panchayati Raj Institutions.

An integrated spatial and sectoral planning would be required in the rural areas for:

- ✓ Managing growth and change over time

- ✓ Providing for orderly and predictable development in the future
- ✓ Protecting and managing environmental resources
- ✓ Setting priorities for developing and maintaining infrastructure and public facilities
- ✓ Strengthening local identity and character of the village;
- ✓ Creating a framework for future policy decisions for all stakeholders
- ✓ Promoting inclusive, open, and democratic planning
- ✓ Providing guidance to land-owners, developers, and Government authorities

In India, the spatial units such as Gram Panchayat, Community Development Blocks, Revenue Districts and other special purpose regions are considered the building blocks of economic planning, apart from the States and Union Territories. A number of attempts have been made since the Fourth Five Year Plans (1969-74) to evolve planning guidelines at district and block level by the Planning Commission and the States have also participated in this exercise but have never given serious thought to a decentralized planning process. The basic objective of balanced regional development and social justice can hardly be achieved without spatial planning at such decentralized levels-districts and community development blocks or areas level planning.

1.2 Gram Panchayat Spatial Development Plan: Saraighat Gaon Panchayat

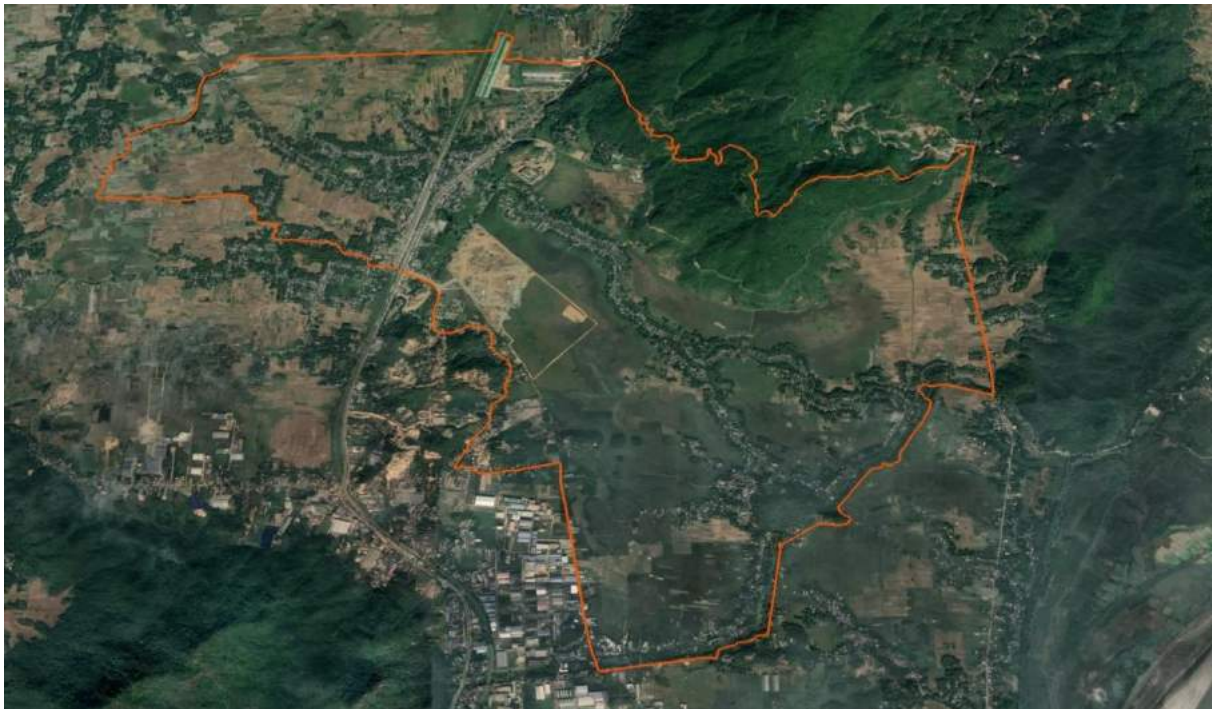


Fig.1.1 Areal View of Saraighat GP

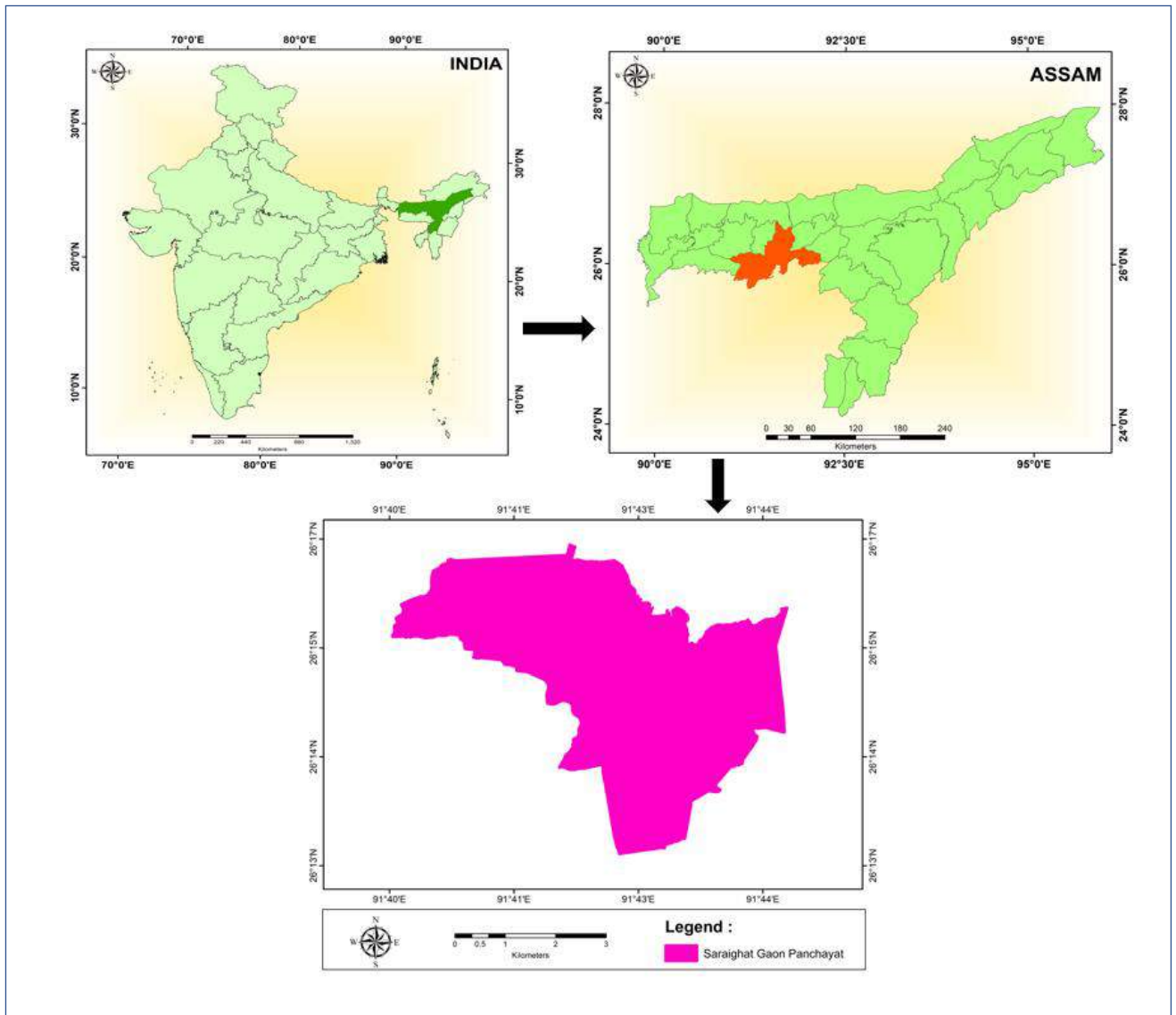


Fig. 1.2 Geographic Location of Saraighat GP

Saraighat Gaon panchayat is located under Bezera block in Kamrup district of Assam State, India. The total area is spread over 20.19 sq. km having latitude $26^{\circ}13' N - 26^{\circ}17' N$ & longitude $91^{\circ}40' E - 91^{\circ}44' E$. The GP is surrounded by Rudreswar GP in the east, Burkha & Bunmuja Gaon in the west, Notuanesa hill in the north and Rodohola & Dhupatari Goan in the south. The overall population of Saraighat GP is around 16000. The region comprises of Hindu and Muslim percentage of 40:60 respectively. The region comprises of ST, SC and OBC population percentages of 4%, 1%, 25 % respectively. The overall literacy rate of the village is around 88.89% and female sex ratio is 856. The GP is famous for its traditional handloom and textile activities. The people of this region, mainly the women folk are expert weavers by tradition from the ancient period of time. However, this traditional practice of weaving is diminishing in due course of time.

1.2.1 Socio-Demography:

According to 2021 Gaon Panchayat Survey, the overall population of Saraighat GP is around 16000 with Population Density 792/sq. km. Total number of Household (HH) is 3500 with 8160 male and 7840 females and Child population(0-6yrs) is 1467. The region comprises of ST, SC and OBC population percentages of 4%, 1%, 25 % respectively. The overall literacy rate of the village is around 88.89% and female sex ratio is 856.

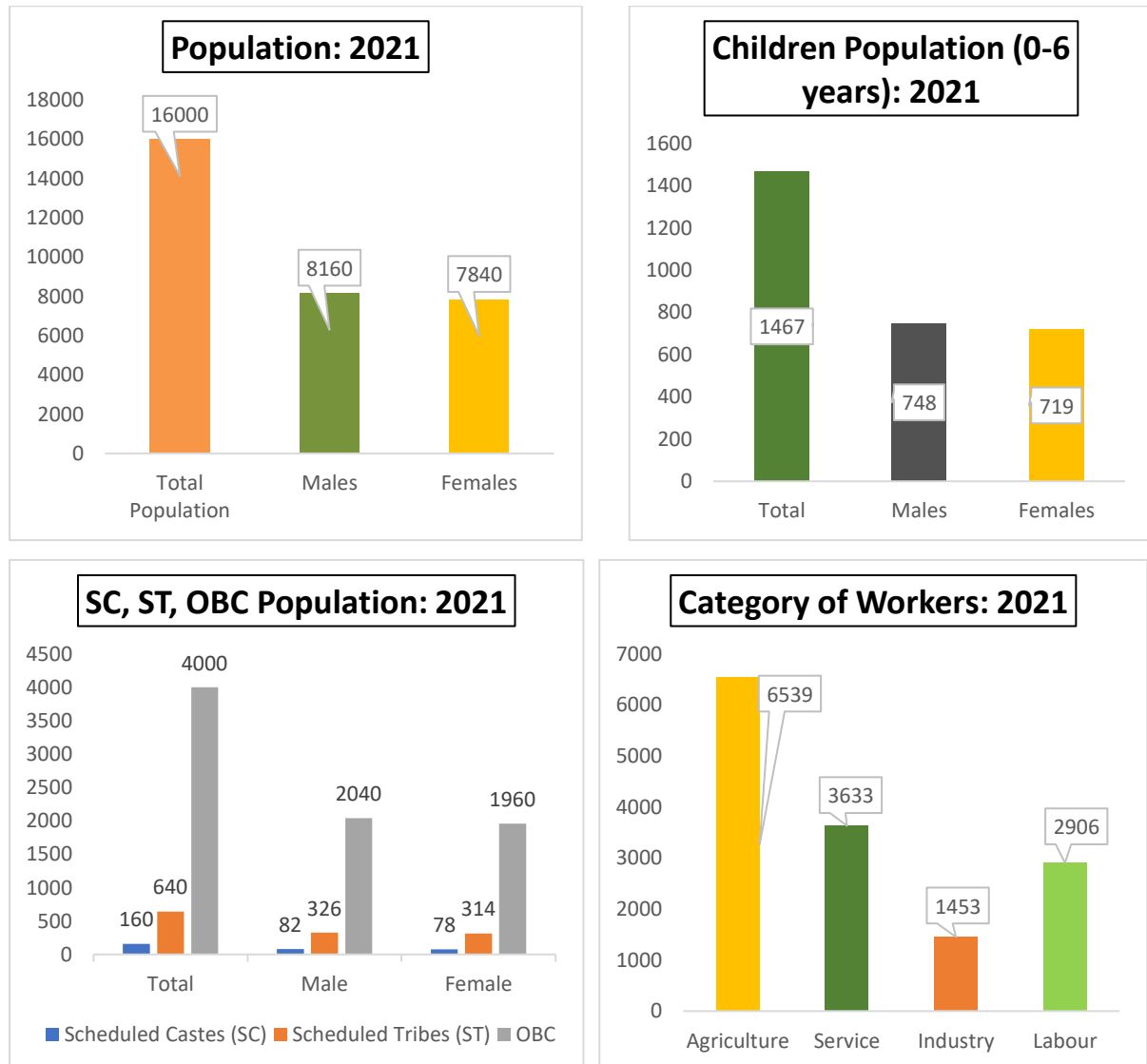


Fig. 1.3 Socio-Demographic Aspect of Saraighat GP



Fig 1.4: Putola Dance

1.2.2 Culture:

The culture of Saraighat GP is traditionally a hybrid one, developed due to cultural assimilation of different ethno-cultural groups under various political-economic systems in different periods of its history. The major components of the culture are:

Putola Dance: This form is known by other names too such as Boti Putola, Tatek Naat, Putola Bhaona etc. Although this art has begun to perish from the urban society, it is still considered to be an easy medium of mass communication in the rural places. This art form which is primarily based on movements and gestures made with hands requires open spaces for performance.

Nagara Nam: The Nagara Nam art form has direct or indirect influence on the socioeconomic aspect. Its performance has deep culture and spiritual significance. It has become an essential part of folk culture with great contribution to the age-old religious faiths in Assamese society.

Ojapali: Ojapali is one of the unique forms of arts of this area which involves three art forms - Song, Dance and Drama. It is performed by a group of 4 or 5 men of whom the chief performer is called Oja who is supported by 3 to 4 Palis, and hence the name Ojapali. The only instrument played by Ojapali is Khutitaal (palm sized Cymbal). The performers wear long sleeved white gowns, silver jewelry etc. and Nupur.



Fig 1.5 Nagara Nam



Fig 1.6 Ojapali



Fig 1.7 Bishnu Mancha



Fig. 1.8 Shiv Mandir

However, these traditional cultural festivals are diminishing in due course of time. Some of the local festivals prevalent in the GP are DouL Utsav, Shankar Utsav, Mohohou Utsav, Eid, Durga Puja, etc.

1.2.3 Religion:

The region comprises of both Hindu and Muslim community. There are 11 “Namghars” (religious place) and 15 Masjids in the GP. There are 5 Naamghars which are more than 100 years older having historical significance.

1.2.4 Climate:

Saraighat experiences a cold and foggy winter, a moderately hot spring and a temperately hot but humid summer. In March and April, the weather begins to grow a little warmer. Average temperature ranges from 12 to 38 ° C during the year. In winter, temperature ranges from 15 to 25 ° C during day and 8 to 15 ° C during night. The summer temperature ranges from 25 to 38C ° during day and 15 to 25 ° C during night. Average annual rainfall varies from 1500 mm to 2600 mm in Kamrup district as well as in Saraighat.

1.2.5 Rainfall Runoff Estimation:

Runoff modeling is relationships for the basin are considered using the SCS curve number method. In undertaking hydrological modeling using remote sensing data in GIS environment the SCS curve runoff model is largely suitable due to its reliance on land cover parameters which can be extracted from remote sensing (Senay et al., 2004).

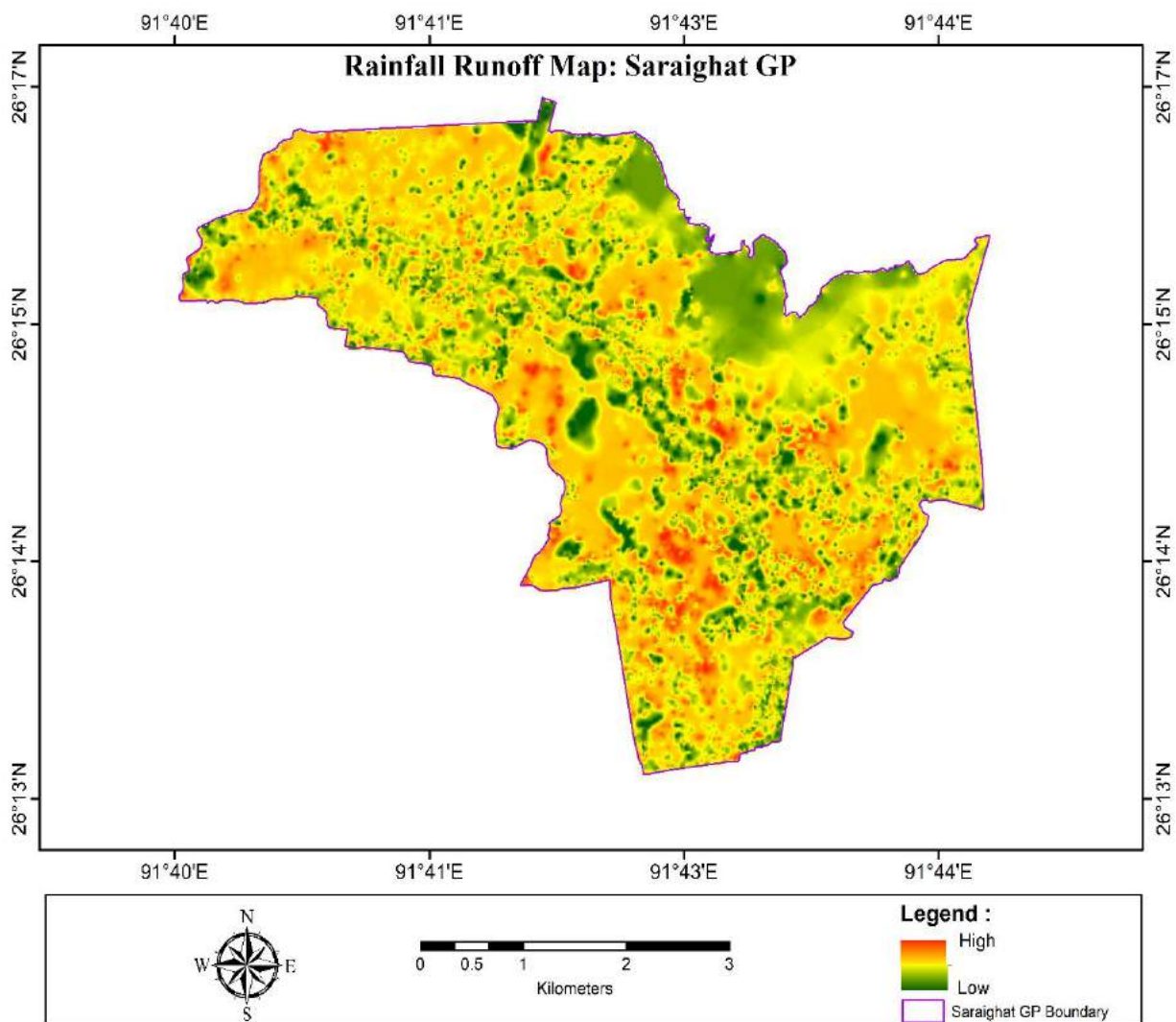


Fig 1.9 Rainfall-Runoff Map of Saraighat GP

Runoff curve number equation estimates total runoff from total rainfall and this relationship excludes time as a variable and rainfall intensity. Its stability is ensured by the fact that runoff depth (Q) is bounded between the maximum rainfall depth (P). This implies that as rainfall amount increase the actual retention (P-Q), approaches a constant value; the maximum potential retention (USDA, 2004).

The runoff estimation related runoff (Q) to precipitation (P) and the curve number (CN) which is in turn related to storage (S). CN is based on the following parameters; hydrologic soil group, land use and treatment classes, hydrologic surface conditions. Equation 3 known as the runoff curve number gives the relationship between the parameters described below.

$$\frac{(P-Ia)^2}{(P-Ia)+S} \quad (3)$$

Where;

Q = runoff depth (mm)

P = rainfall (mm)

S = potential maximum retention after runoff starts (mm)

Ia = initial abstraction (mm)

Initial abstraction consists mainly of interception, infiltration during early parts of the storm, and surface depression storage. Its determination is not easy due to the variability of infiltration during the early part of the storm since it depends on conditions of the watershed at the start of a storm such as the land cover, surface conditions and rainfall intensity; thus, it is assumed to be a function of the maximum potential retention. (USDA, 2004)

$$Ia = 0.2S \quad (4)$$

Potential maximum retention (S) can be calculated by the Curve Number as below:

$$S = 25400 / CN - 254 \quad (5)$$

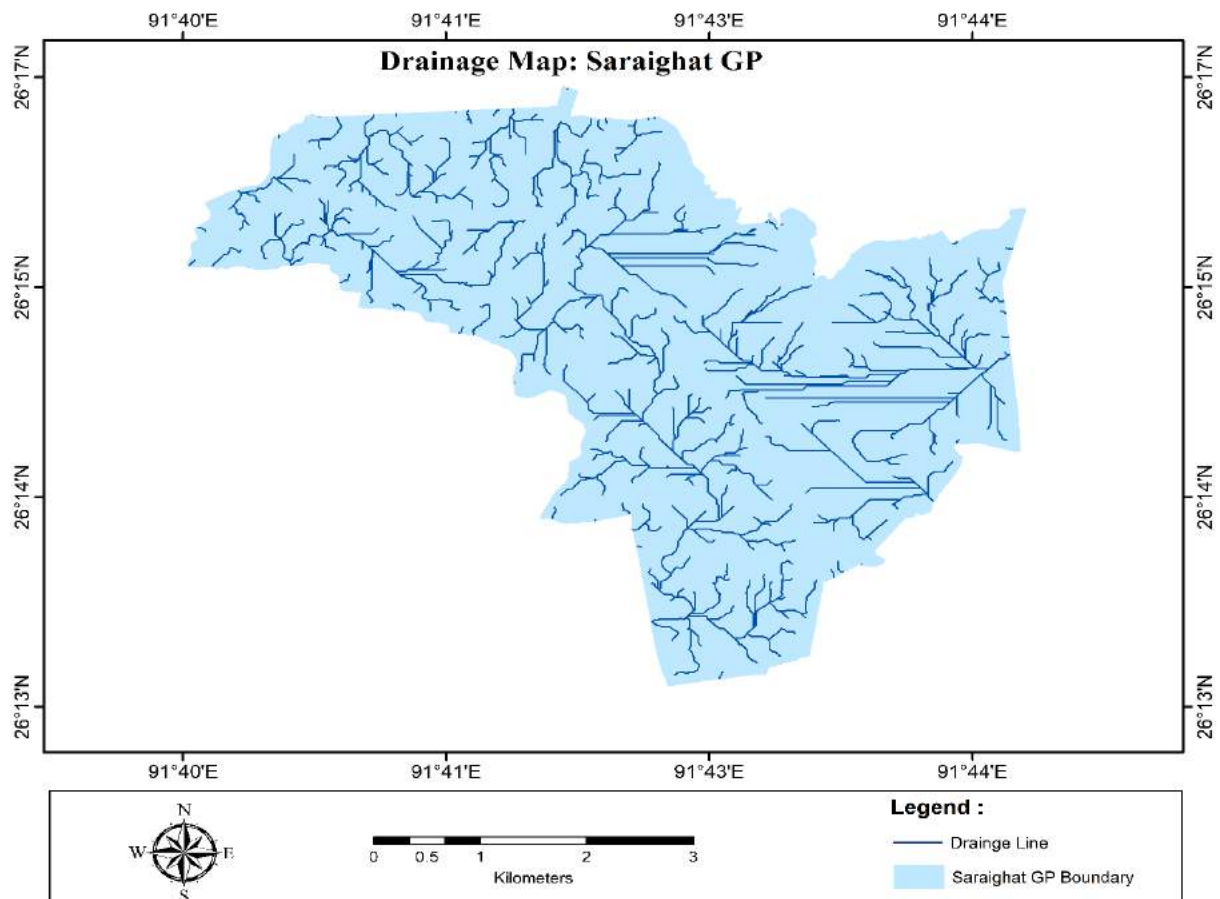


Fig 1.10 Drainage map of Saraighat GP

The soil conservation service (SCS) model depends on the runoff Curve Number (CN). Curved Number is estimated via the effect of soil and land cover on the rainfall runoff processes. The range of the Curve Number (CN) is between 1 (100 % rainfall infiltration) and 100, lower values of the Curve Number indicate lower runoff, while higher values of Curve Number refer to higher values of runoff.

Rainfall run-off map is prepared by using rainfall data from the year 2015 to 2020. Rainfall run-off is less in the southern portion of the region where infiltration occurrence is more and the region is mostly converted to wasteland or water-logged area. These areas can be used for pisciculture and irrigation purposes to the nearby agricultural region.

1.2.6 Geology and Geomorphology:

Geologically, Saraighat GP comprises of Quaternary fluvial sediments and following types of geomorphic landforms are there: Pediment-Pediplain Complex, Active Flood Plain, Older Alluvial Plain, Older Flood Plain, Highly Dissected Hills, Moderately Dissected Hills and Waterbodies.

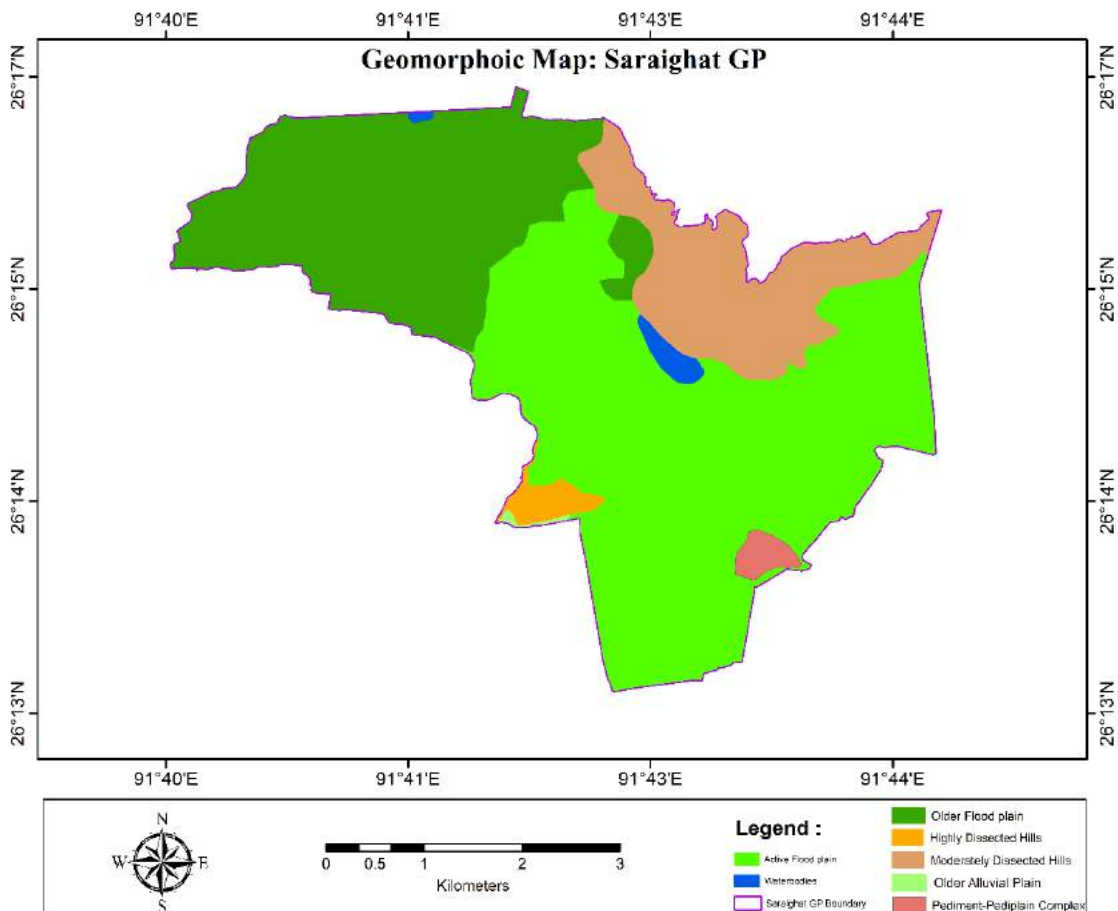


Fig 1.11 Geomorphology Map of Saraighat

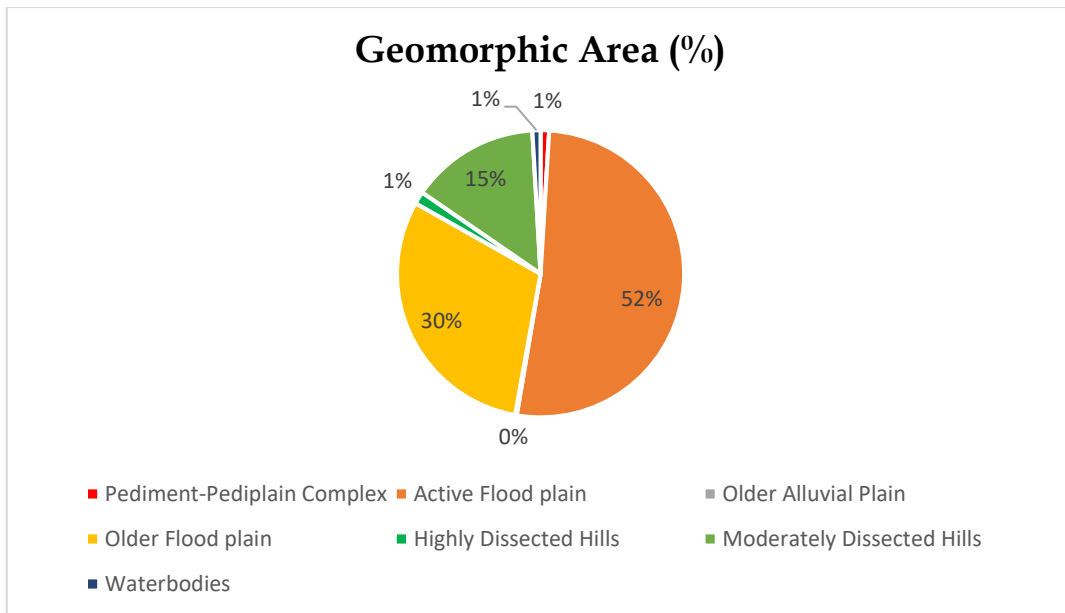


Fig 1.12 Percentage distribution of Geomorphic area

1.2.7 Lithology:

Lithologically, Saraighat comprises of Banded Migmatite/Granitoid Qtzfelspathic Gneiss, Unsterilized Sand, Silt and Clay and White to Greyish Sand, Silt, Pebble and Clay.

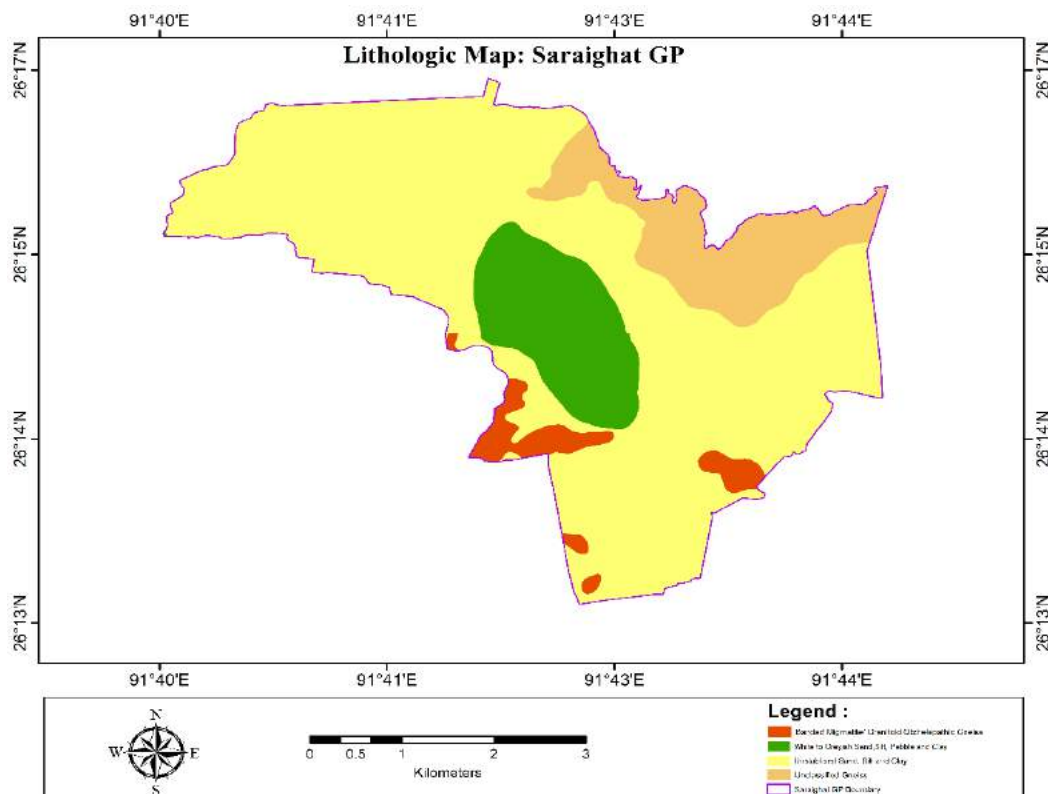


Fig 1.13 Lithology map of Saraighat GP

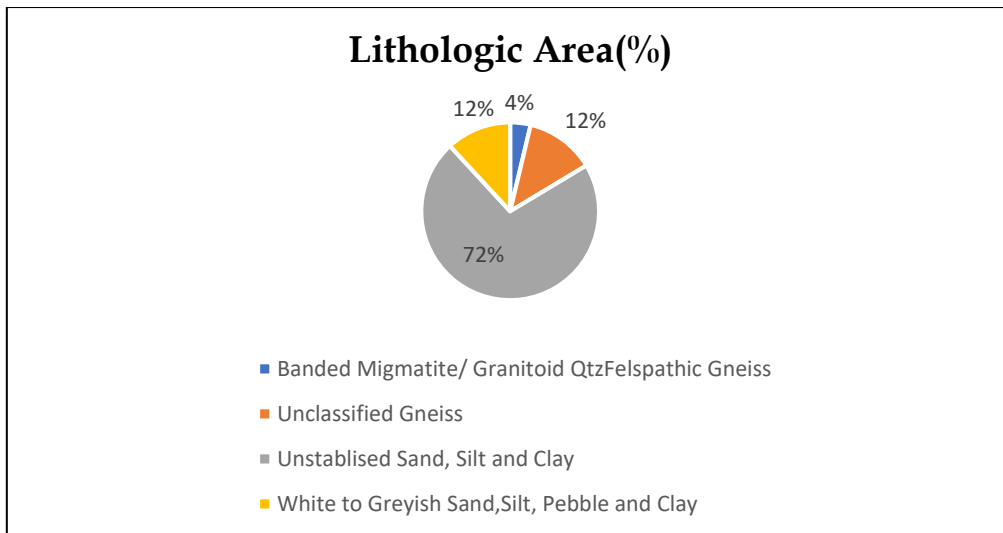


Fig. 1.14 Percentage distribution of lithologic area

1.2.8 Topography:

The major part of the Saraighat GP is mostly plane, however, the north-eastern part of the GP comprises of structural hills, having slightly higher elevation than the plain area, and on the other hand, the southern part of the GP comprises of lowland area. The plane area is good for construction, agriculture and industrial space.

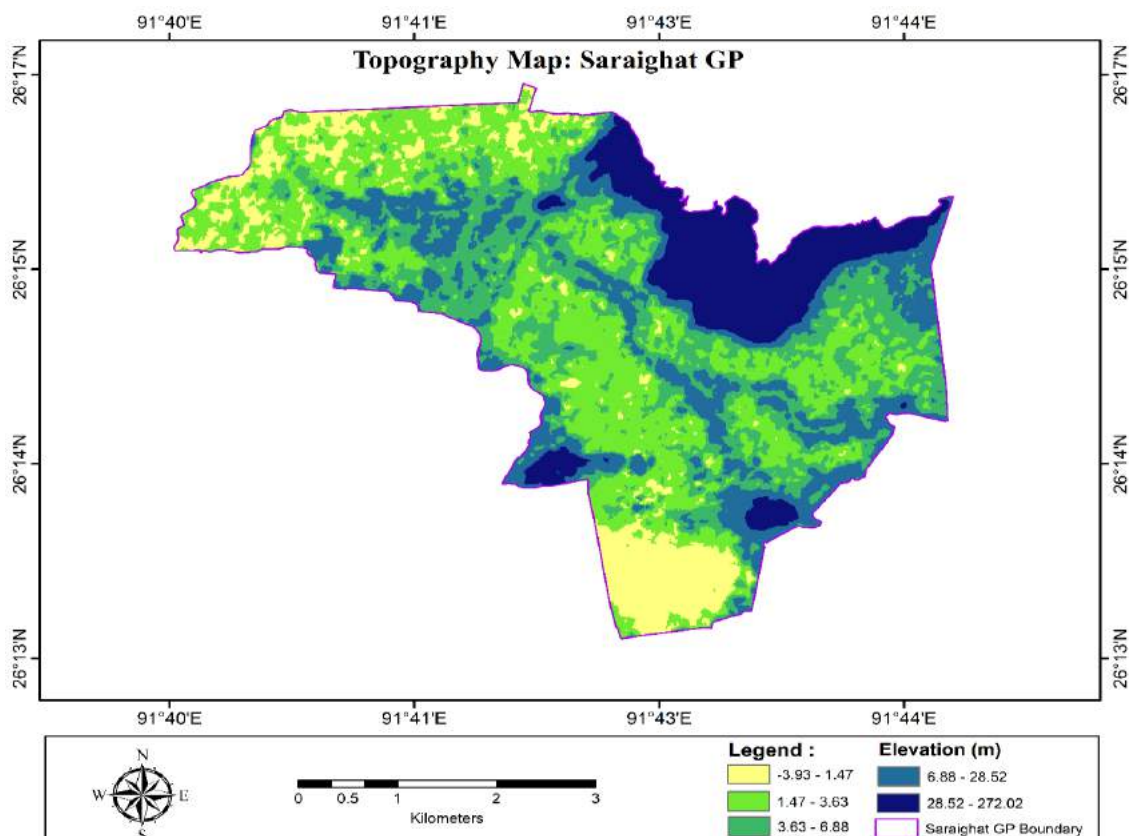


Fig 1.15 Topography map of Saraighat GP

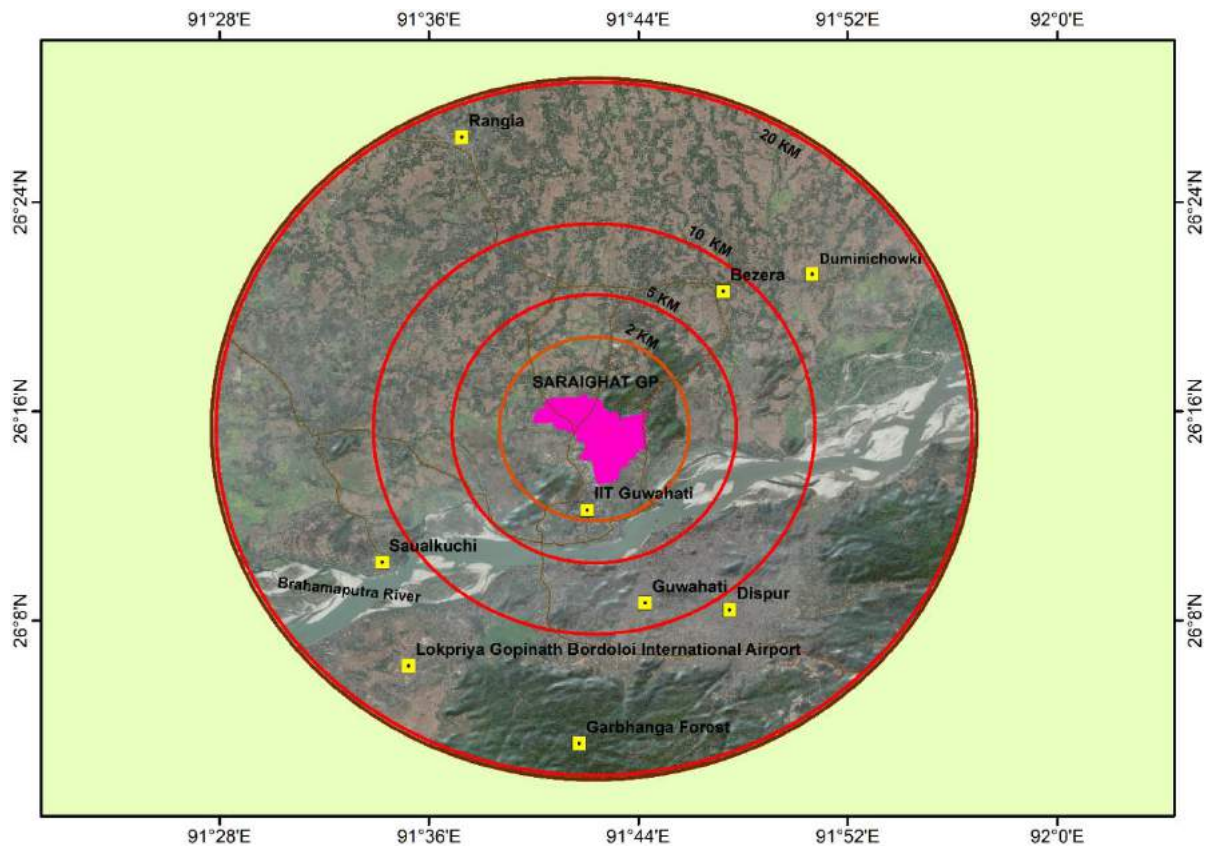


Fig. 1.16 Regional Connectivity of Saraighat GP

1.2.9 Regional Connectivity:

The overall connectivity of Saraighat GP to other regional settlement is quite good. The GP is surrounded by Rudreswar GP in the east, Burkha & Bunmuja Gaon in the west, Notuanesa hill in the north and Rodohola & Dhupatari Goan in the south. The IIT Guwahati is within 2km circular radius of the GP. The Guwahati city and Bezera are within 10 km circular radius of the GP. The places like Sualkuchi, Dispur, Duminichowki, Rangia, Lokpriya Gopinath Bordoloi International Airport, Brahmaputra River, Garbhanga Forest are within 20km circular radius of the GP.

1.2.10 Administrative Setup in the Gaon Panchayat

Assam has a very strong historical background of local self-government. The villages in Assam had a strong Panchayat in different names or forms since long past. Assam was one of the pioneer States in India to enact Panchayat Act and establish Panchayati Raj in the State when the Assam Rural Panchayat Act, 1948 was passed. This Act was amended and replaced by the Assam Panchayat Act, 1959, the Assam Panchayati Raj Act, 1972, the Assam Panchayati Raj Act, 1986 and finally the Assam Panchayat Act, 1994 which incorporated the

provisions of the 73rd Amendment Act, 1992 of the Constitution of India. The Assam Panchayat Act, 1994 received the assent of the Governor on the 22nd April 1994 and elections were held in October 1996, for establishing a three-tier Panchayati Raj system in the State at the village, intermediate and district level. Gaon Panchayats (GPs) at the village level are the key units, while the middle level comprises of Anchalik Panchayat (AP) at the block level, and Zilla Parishads (ZPs) at the apex level.

The Panchayat body shall consist of 10 members directly elected by the voters of the territorial constituencies and the President of the Gaon Panchayat who shall also be directly elected. A Vice-President shall be elected from and by the members in the first meeting to be called by the Deputy Commissioner or an Officer authorized by him. The Gaon Panchayat is required to meet at least once in two months. In addition, it is to work through 3 standing committees namely Development Committee, Social Justice Committee and Social Welfare Committee.

The Act provides for a Gaon Sabha (constitutional equivalent of Gram Sabha) for every Gaon Panchayat area consisting of persons registered in the electoral rolls of the area. As per the Act the population of the area of the Gaon Sabha shall be between 6000 and 10,000. So, the number of members (who are the adult persons and voters in the general election) will be quite large and residentially scattered over a relatively large area given the density of population of Assam.

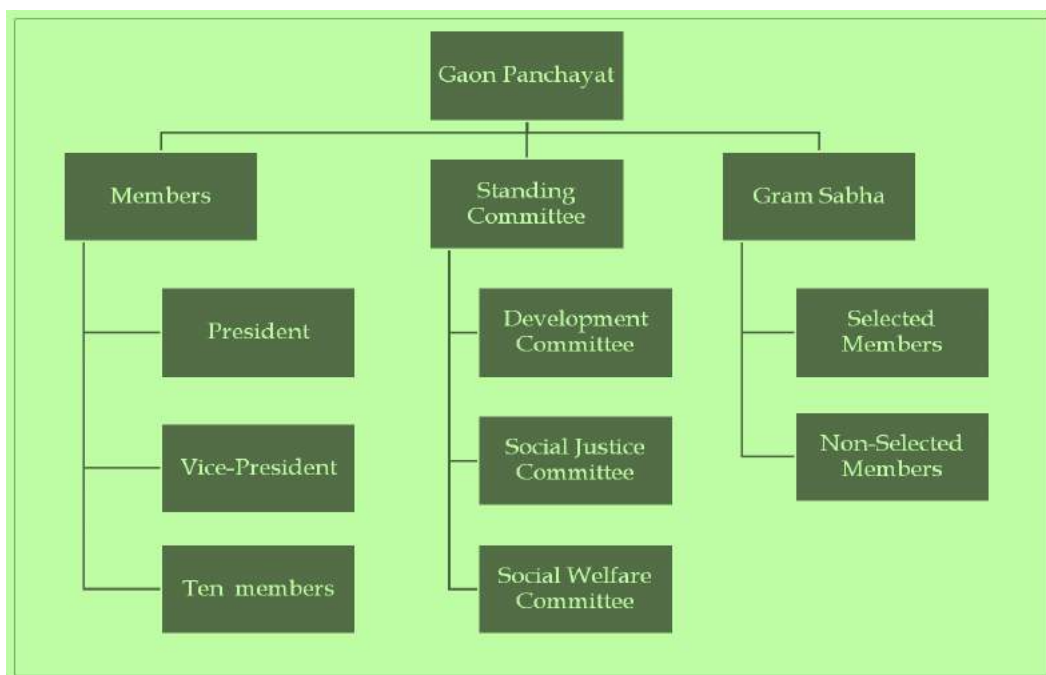


Fig 1.17 Administrative set-up in Saraighat GP

1.2.11 Methodology

The Methodology adopted for the Saraighat Gaon Panchayat Spatial Development Plan is presented in Fig 1.18.

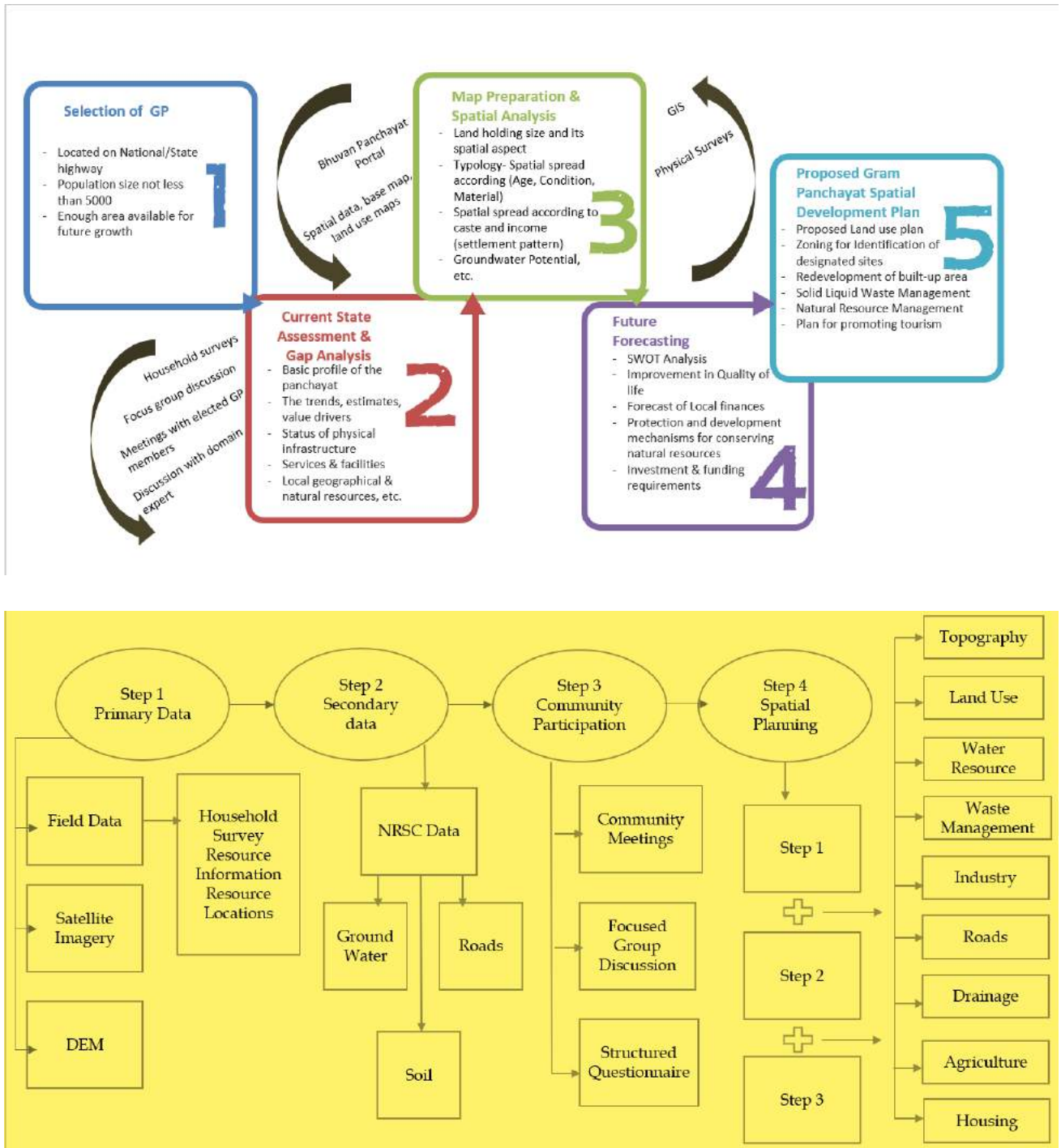


Fig 1.18 Methodology

CHAPTER 2

SPATIAL ANALYSIS AND PROPOSAL FOR GAON PANCHAYAT SPATIAL DEVELOPMENT PLAN

In the present work, a field survey was conducted to collect the baseline data of the village. These data are analysed to assess the current situations, facilities available in the village. In the first stage, spatial analysis is made on the basic parameters like utilization of land use and land cover, land use & management of abadi area, agriculture, natural resource management, livelihood, etc. In the second stage, a spatial development plan is proposed by projecting the growth, potential and opportunities in the village in view of the next 20 years vision.

2.1 Utilization of Land Use and Land Cover (LULC)

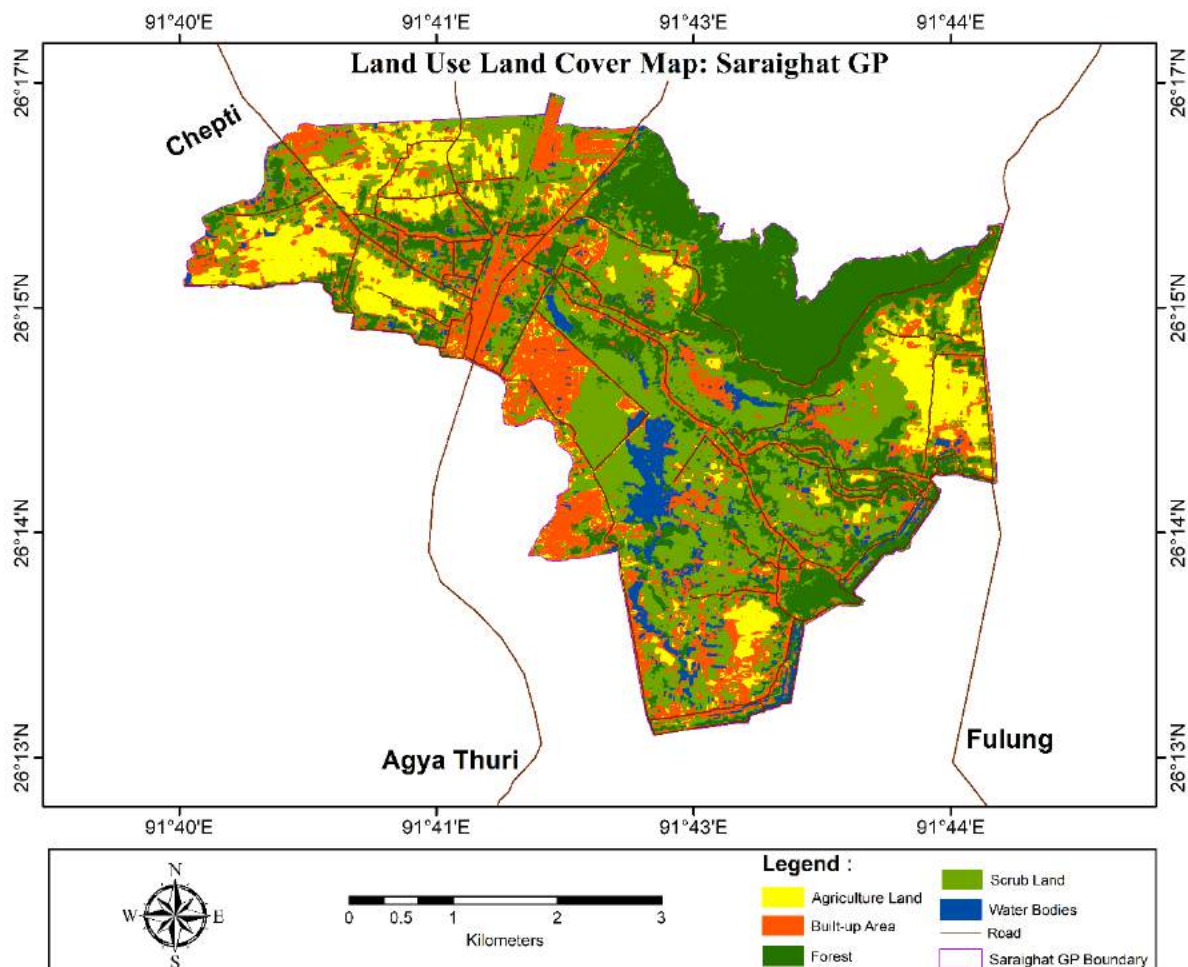


Fig 2.1 LULC Map of Saraighat GP

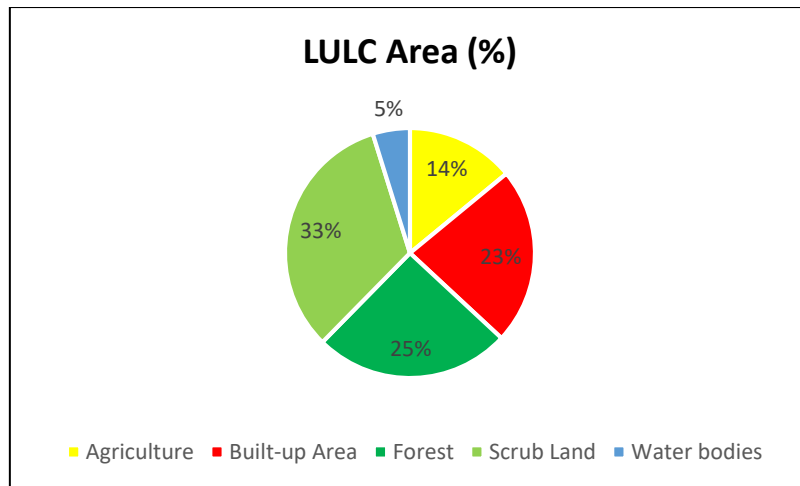


Fig 2.2 Land Use Distribution of Saraighat GP

Major portion of the GP, around 33% of the total area of the GP is covered with scrub land. From the pie diagram, it is clear that the GP is not agriculture based as only 14% of total area is covered with agriculture land. The built-up area constitutes of 23% of total area, which covers residential, public and semi-public activities.

2.2. Existing Land & Water Use Management

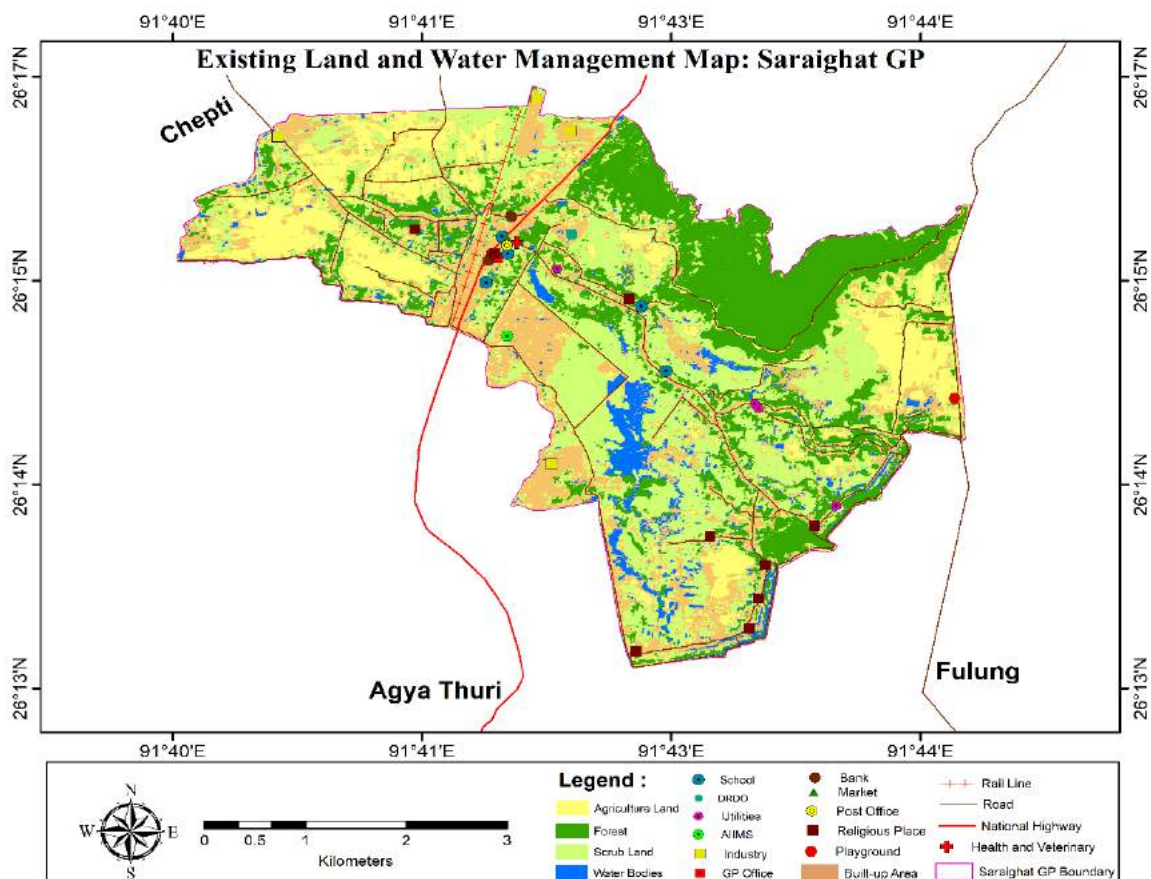


Fig 2.3 Existing Land & Water Management Map of Saraighat GP

NH31 passes through the GP that connect other subsidiary roads. A railway line of around 2.43 km passes through the GP (Changsari Railway Station) providing good connectivity to the people. The dwelling in the GP is spread in a random pattern not following a specific pattern. Due to industrialization, the urban growth is rapidly increasing.

From Fig 2.3, it can be observed that around 33% of total area of GP is occupied by scrub land. These scrub land could be converted to agriculture land and other allied activities by adopting proper land and water management plan. Some of the prevailing challenges are –

- ✓ In the southern part of the GP, there is no proper drainage system or water reservoir exist in the area, hence the water that comes from the hilly areas, are unable to drain out. Gradually these areas are getting converted to scrub land, and are unutilized at present.

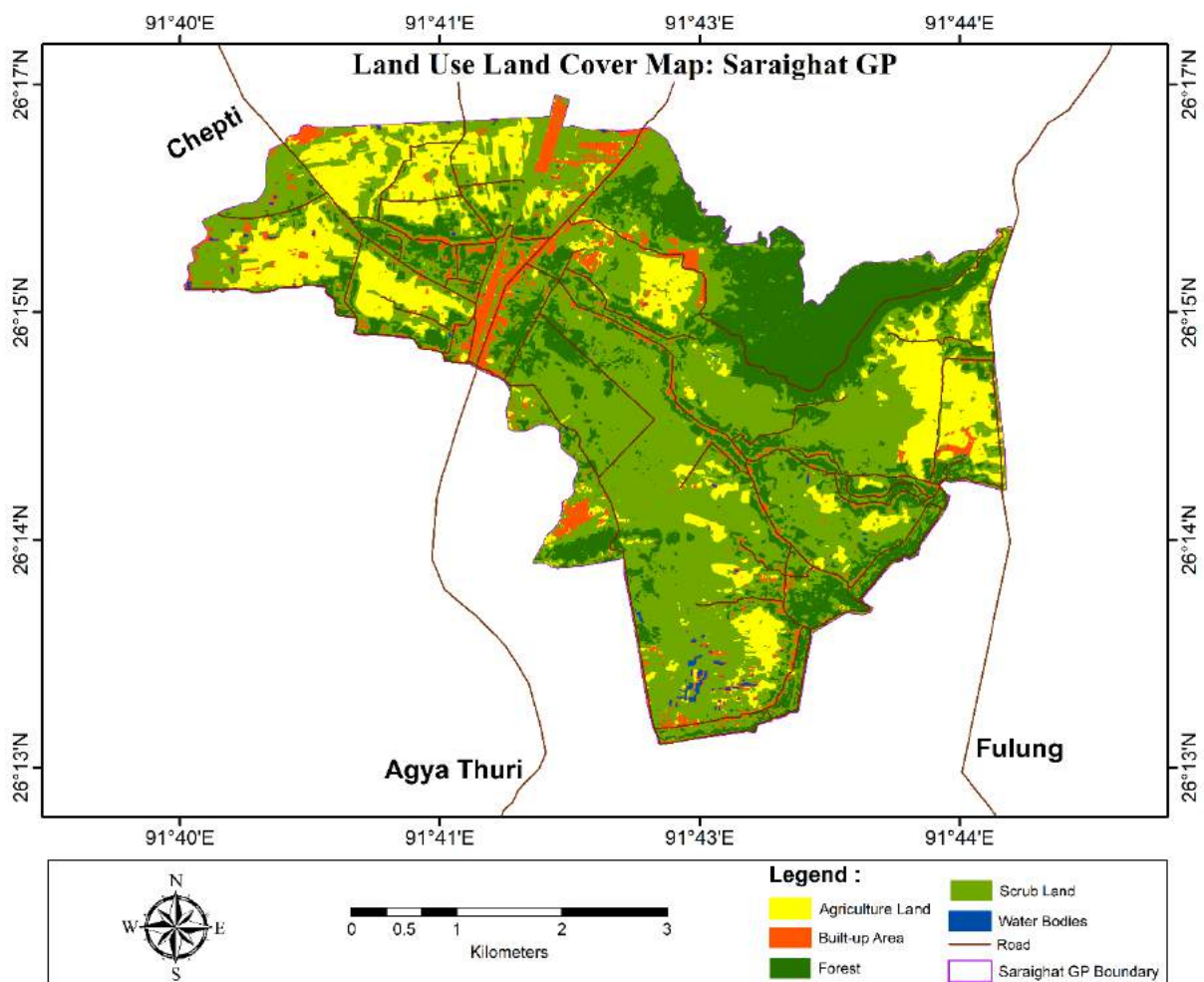


Fig 2.4 LULC Map of Saraighat GP before AIIMS

- ✓ Hence, the people are not interested in agriculture activities in these areas (around 14% of total land area), and selling their lands to outsiders for establishing industries. Already, in the north-west part of the GP, All India Institute of Medical Sciences, Guwahati is under construction along with other industries.
- ✓ The water from the GP would get accumulated in a subsided area, where now AIIMS has been setting up, and therefore due to hindrance to the flow of water, the areas are getting flooded in the rainy season. These causes stress to the agriculture cultivation, and people are now shifting from agriculture activities to other sectors. Hence, construction of proper drainage system is of utmost important in these areas.

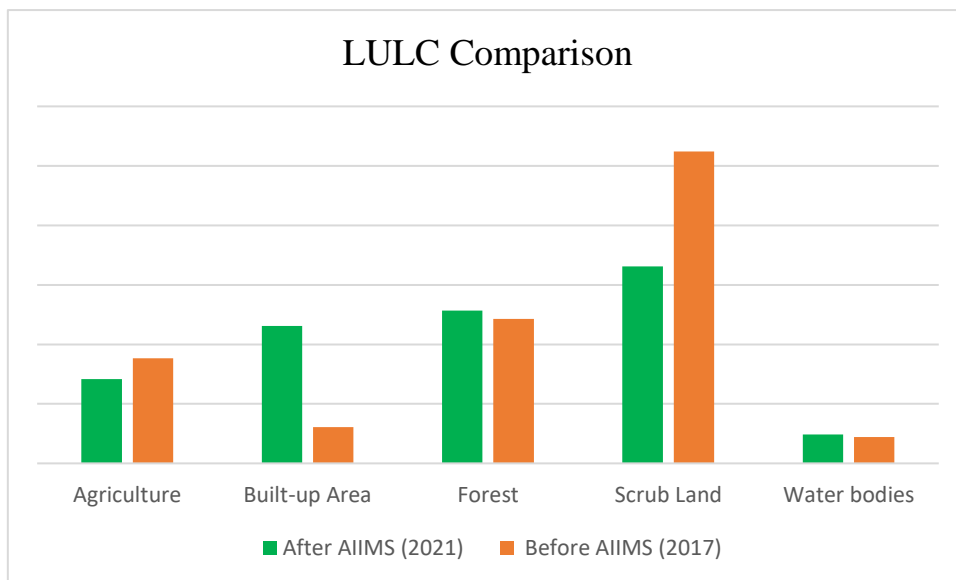


Fig 2.5 LULC Comparison

From fig 2.5 it can be inferred that there has been significant increase in the built-up growth since 2017. Major percentage of scrub land has been converted into built-up area. A minor amount of changes has been observed in case of agriculture and forest areas.

2.3 Land Use & Management of Abadi Area

Abadi area consists of approximately 23% of total area of Saraighat GP. Around 80% of the abadi area is under residential land use and other remaining area is used for various public and semi-public activities like panchayat office, schools, banks, post office, religious places, playground, etc.

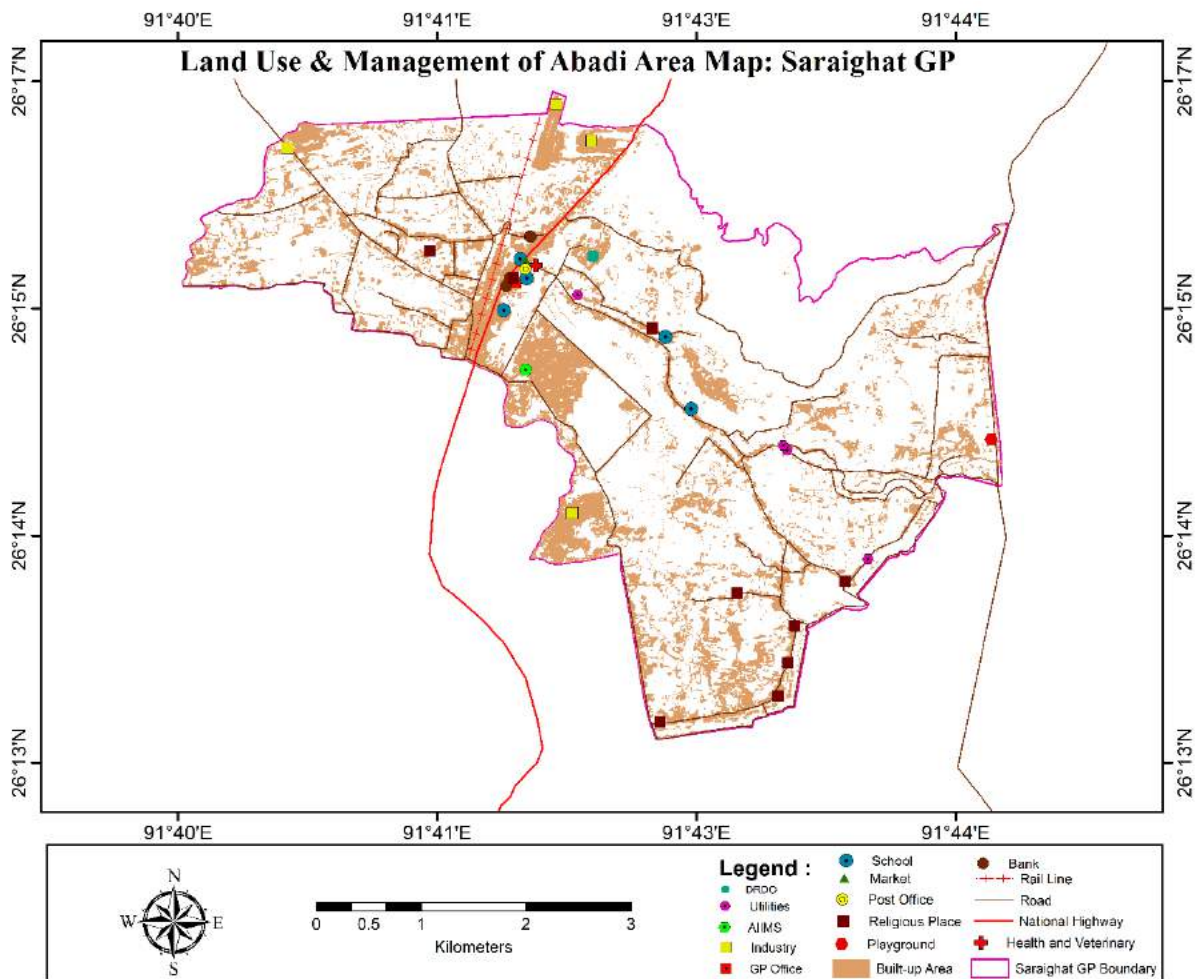


Fig 2.6 Land Use & Management of Abadi area

The abadi area is divided into three categories, and individual analysis is made on each category:

1. Physical Infrastructure
2. Social Infrastructure
3. Other Social Infrastructure

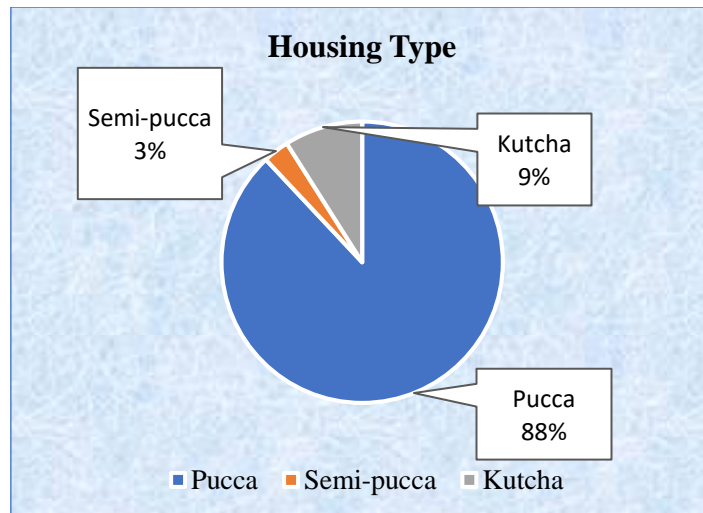


Fig 2.7 Percentage distribution of Housing Type

2.3.1 Physical Infrastructure

2.3.1.1 Housing

Housing Type

- ✓ The houses in Saraighat GP are mainly categorized into three types – Pucca, Semi-Pucca and Kutcha. Around 88% houses are pucca, 3% houses are semi-pucca and 9% houses are kutcha.
- ✓ There are total around 3500 houses in the GP, and around 425 houses fall under Kutcha & Semi-Pucca housing types.
- ✓ The life of these pucca houses are >30 years, semi-pucca houses-20-30 years and kutcha houses 4-5 years.



a) Pucca

b) Kutcha

Fig 2.8 Housing Type

Housing Style

- The houses built in Saraighat GP are generally of Assam Type which accounts for almost 95% of total houses built and only 5% houses are of RCC Type.
- In Assam Type houses, the roof is typically erected by high gables to overcome heavy rainfall in the region, where walls are usually timber framed, plastered with cement.
- Total houses built under PMAY-G scheme in the last 5 years is 69. Up till now, around 1000 houses are built under Govt. Scheme in the Gaon Panchayat.

Table 2.1 Houses built under PMAY-G

Year	No of Houses Built
2016-17	23
2017-18	2
2018-19	NIL
2019-20	44



a) Assam Type

b) RCC Type

c) PMAY-G Houses

Fig 2.9 Housing Type & House built under Govt. Scheme

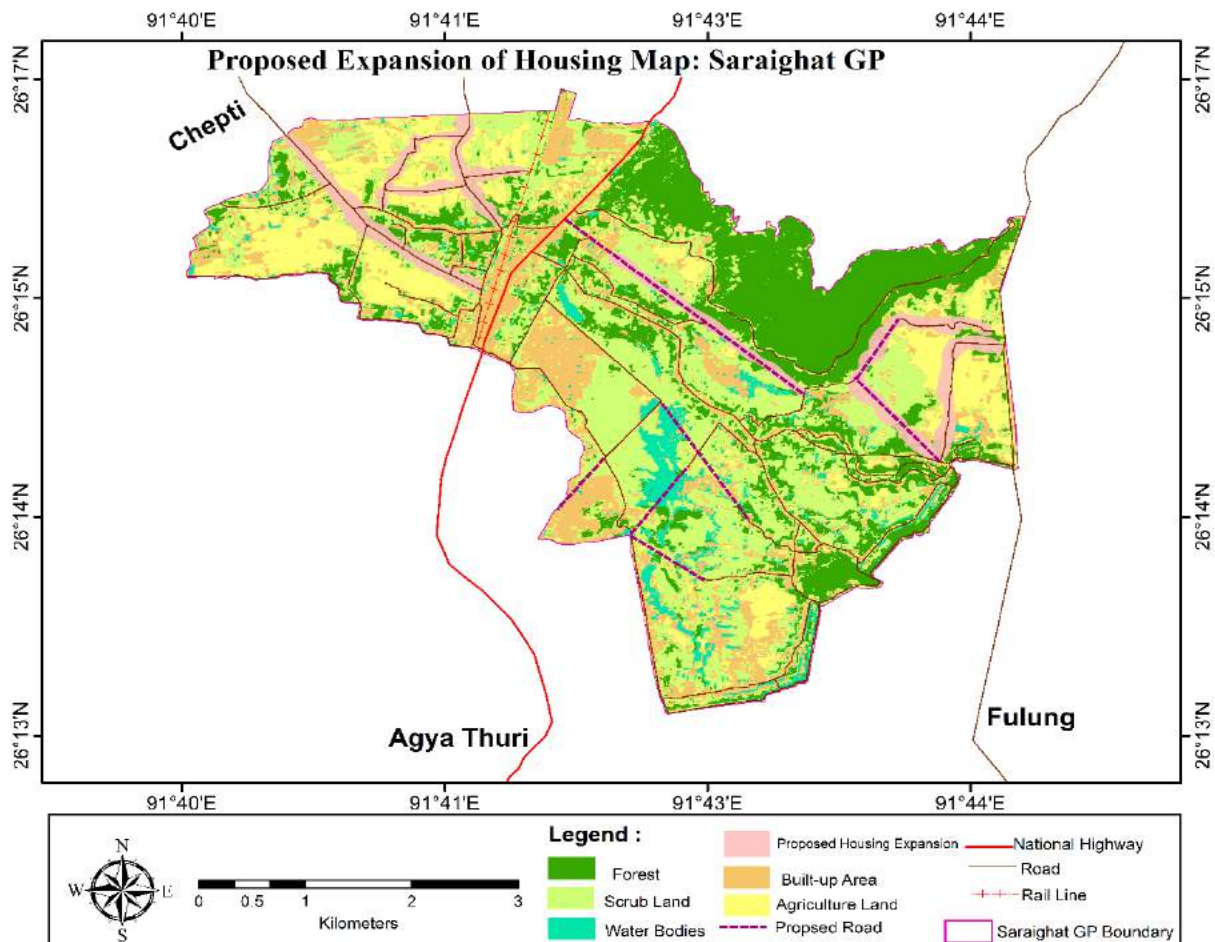


Fig 2.10 Proposed expansion of housing

Proposed Housing Development

As shown in Fig 2.11, around estimated 960 more houses to be built in the next 10 years, and for the next 20 years, another 1091 houses to be constructed i.e., around 2051 more household from the current state. Expansion of housing is proposed with primary objective to ensure sanctity of agricultural and green/vegetation/grazing lands, for a sustainable future.

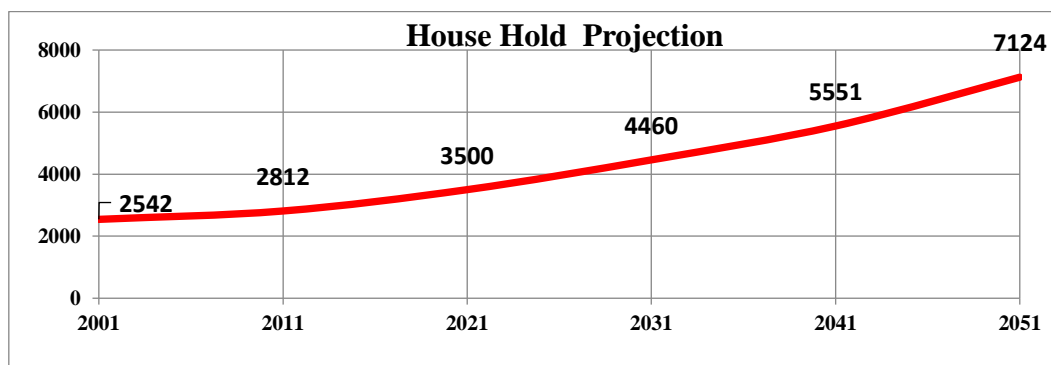


Fig 2.11 Household Projection

Proposed Housing & Amenities

1. Present Housing Cluster

- Progressive allowance of G + 3 housing along Primary and Secondary roads & G + 2 for houses along tertiary streets, with adequate open space and gaps between housing as per revised NBC
- Recommending a mixed (Pucca + kutchha) approach
- Mandating/subsidizing installation of solar for water heating and electricity; rain-water harvesting and bio-toilets.

2. Future expansion for housing

- Proposed plot by plot, uniformly planned expansion for housing in future (upon exhaustion of 1)

3. Curtailment of future building

- Stringent policy measures to be implemented to ensure no expansion for housing in future amidst agricultural land.



a) Solar Panels

b) Composting Toilet

c) Rain water harvesting

Fig 2.12 Proposed Housing Amenities

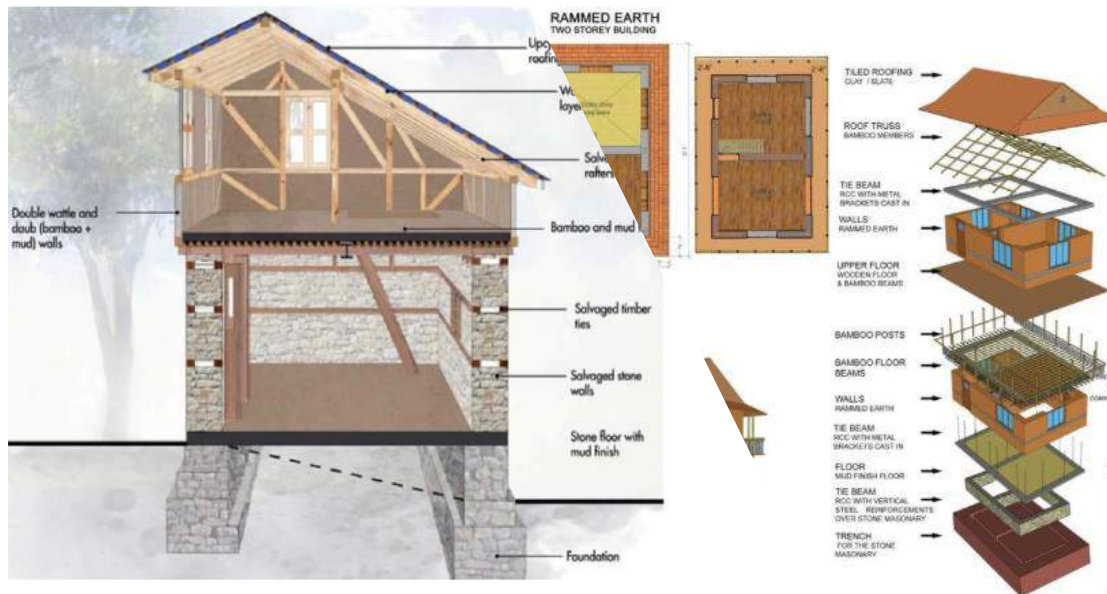


Fig 2.13 Proposed Housing Type - Maintaining Assam Vernacular Architectural Language

Design & Construction of Assam-Type Houses

According to GSHAP data, the state of Assam lies in a region with high to very high seismic hazard. As per the 2002 Bureau of Indian Standards (BIS) map, this state also falls in Zone V. Historically, parts of this state have experienced seismic activity greater than M6.0.

Seismic Zone Map of India: -2002

About **59 percent** of the land area of India is liable to seismic hazard damage

Zone	Intensity
Zone V	Very High Risk Zone Area liable to shaking Intensity IX (and above)
Zone IV	High Risk Zone Intensity VIII
Zone III	Moderate Risk Zone Intensity VII
Zone II	Low Risk Zone VI (and lower)

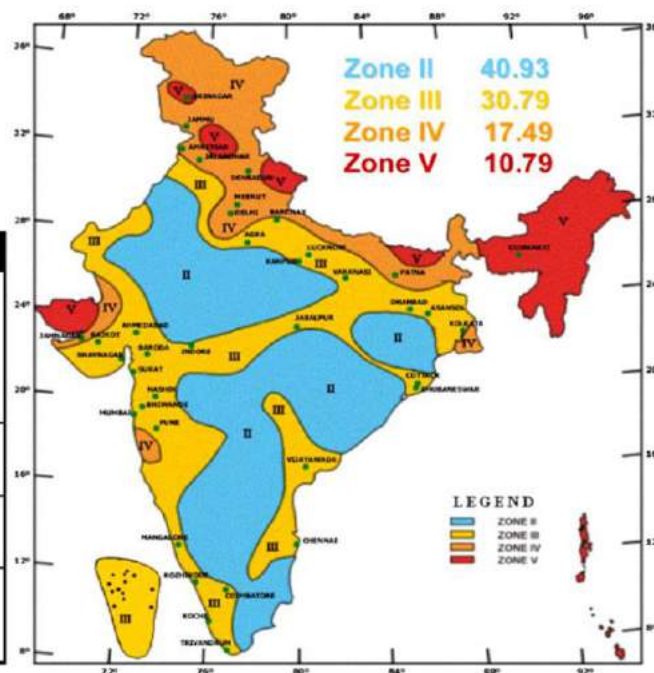


Fig: 2.14 Seismic Zonation & Intensity Map of India

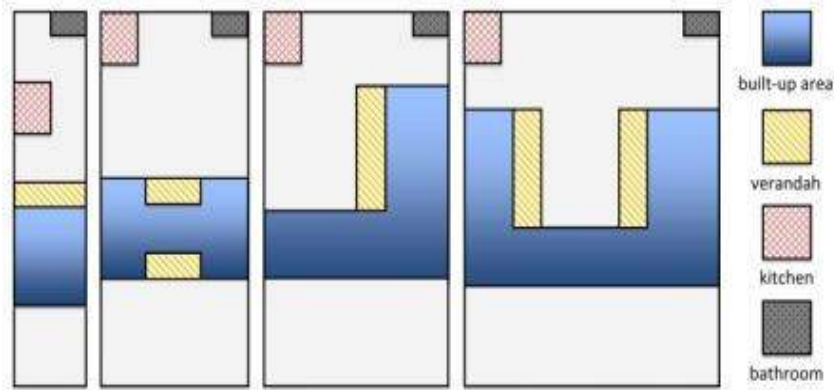


Fig 2.15: Plan variations of typical Assam-type houses

Considering earthquake zone V and land type both plain and elevated, Assam-type architecture and construction are proposed as this vernacular style is climatologically responsive and earthquake resistant. Assam-type homes are built on both flat and sloped terrain. The houses proposed for flat terrain - either rectangular, L- or C-shaped and for slopes - mostly rectangular in shape. These houses consist of a verandah, a living room, a kitchen, with bathrooms and toilets built away from the main house.

Following are the design and construction guidelines for Structural Systems and Foundation:

- The Assam type house comprise mostly of a single storey, but in the rare occasion of two storeys, the second storey uses light wood for construction.
- No formal foundation is used in typical Assam-type houses. The main wooden verticals of the house are pierced into the ground by about 600-900 mm. In some cases, involving construction of formal houses, the main wooden posts of the house are supported on masonry or plain concrete pillars constructed over the ground up to plinth or sill level. The connections between wooden posts and the pillars are achieved using steel bolts and U-clamps.

Table 2.2: Foundation Details

Type	Description
SHALLOW FOUNDATION	Wall or column embedded into soil, without footing
	Rubble stone, fieldstone isolated footing
	Rubble stone, fieldstone strip footing
	Reinforced Concrete strip footing
	Mat foundation

DEEP FOUNDATION	Reinforced Concrete or Steel bearing piles
	Reinforced Concrete or Steel skin friction piles
	Wood piles
	Cast-in-place concrete piers
	Caissons

Table 2.3: Structural Details

Type		MATERIAL/ TYPE OF LOADBEARING STRUCTURE	SUB-TYPE DESCRIPTION
HYBRID STRUCTURAL SYSTEM	WALLS	Stone Masonry	Rubble stone or Dressed stone in mud/lime mortar
		Adobe/Earthen Walls	Adobe blocks or Mud walls with horizontal wood members; or Rammed earth
		Confined Clay masonry	Clay brick/tile masonry with wooden posts and beams or concrete tie
		Wattle and Daub	Bamboo/reed mesh and posts
	FRAME	Load-bearing Timber	Post and beam wooden frame (with or without tie connections)
			Stud wall frame with board sheathing
		Seismic protection	Base isolation or seismic dampers

Table 2.4 Roof & Floor System

Type		MATERIAL/ TYPE OF LOADBEARING STRUCTURE	SUB-TYPE DESCRIPTION
ROOF AND FLOOR SYSTEM	ROOF	Masonry	Vaulted
			Concrete joists with masonry panels
		Wood/Timber	Thatched roof supported on wooden purlins or Shingle roofs
			Wooden beams supporting clay tiles, natural stone slates, manufactured wood panels
	FLOOR	Concrete	Flat or Waffle slabs
		Wood/Timber	
			Wood planks with ballast and concrete or plaster finish
			Wood planks supporting clay tiles, slate, plywood or manufactured wood panels on joists

Roof & Floor System

Flooring

Different types of flooring can be seen in Assam-type houses. Wooden plank flooring is adopted in stilted houses and mud plaster flooring in rural areas. The elevated floor is made of wood runners of size 50×100 mm spaced at about 300 mm spacing spanning between wood beams of size 120×120 mm spaced at about 600 mm spacing. The floors are covered with 25×2500 mm wood planks of thickness about 25 mm. Other common types of flooring include cement flooring over an under layer of sand or brick soling, etc.

Ceiling

Typical Assam-type houses have false ceilings made of timber, bamboo mats and in modern construction, plywood or AC sheet. The false ceiling provides cool environment inside the house and also prevents falling of insects from the roof. The false ceiling work consists of wooden framing of 75x50 mm scants placed at 600 mm spacing and fixed to the frame work by means of nails. In some houses, ceiling made of Ikra reed (similar to Ikra roof) was also observed, especially above the covered verandah.

Roofing

Pitched CGI (*Corrugated Galvanized Iron*) sheet roofing over timber trusses is the most common form of roofing used in these houses. This roofing is best suited in this area because the region receives high amount of rainfall that may possibly has severe effect on durability of building. Ikra reed can also be used for roofing in rural areas.

Roof Water Harvesting

Roof water from the houses and other paved areas to be collected and stored in sumps for reuse and also for recharging the bore wells after filtering (using pebble, charcoal, sand beds). It would be advantageous to plan this activity while constructing any new houses to collect as much roof water as possible and further for diverting this water to the sumps nearby and to the bore wells, after necessary filtering. Roof water could be harvested by connecting the pipes and bringing the rainwater to a common pipe and then to sumps (size depends on roof area and requirement) after passing through filter beds. This water can be used for flushing, gardening, washing etc. For the new houses, harvesting of roof water, through sumps and recharging bore wells could be planned.

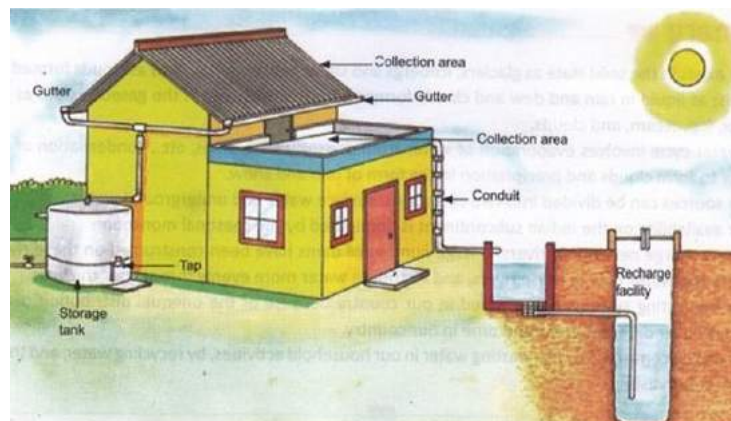


Fig 2.16 Rainwater Harvesting

2.3.1.2 Roads

- ✓ The overall connectivity of village road is quite good in all parts of the GP, having around 97% pucca and 3% kutchha roads.
- ✓ The formation width of the village roads is 6m with carriageway 3.75m, and 1.25m wide side shoulders.
- ✓ Around 20% roads have streetlights, mostly near the main road. Solar street lights are also installed in some places.
- ✓ The roads are constructed under Govt. Schemes like Pradhan Mantri Gram Sadak Yojana and State PNRD Department.

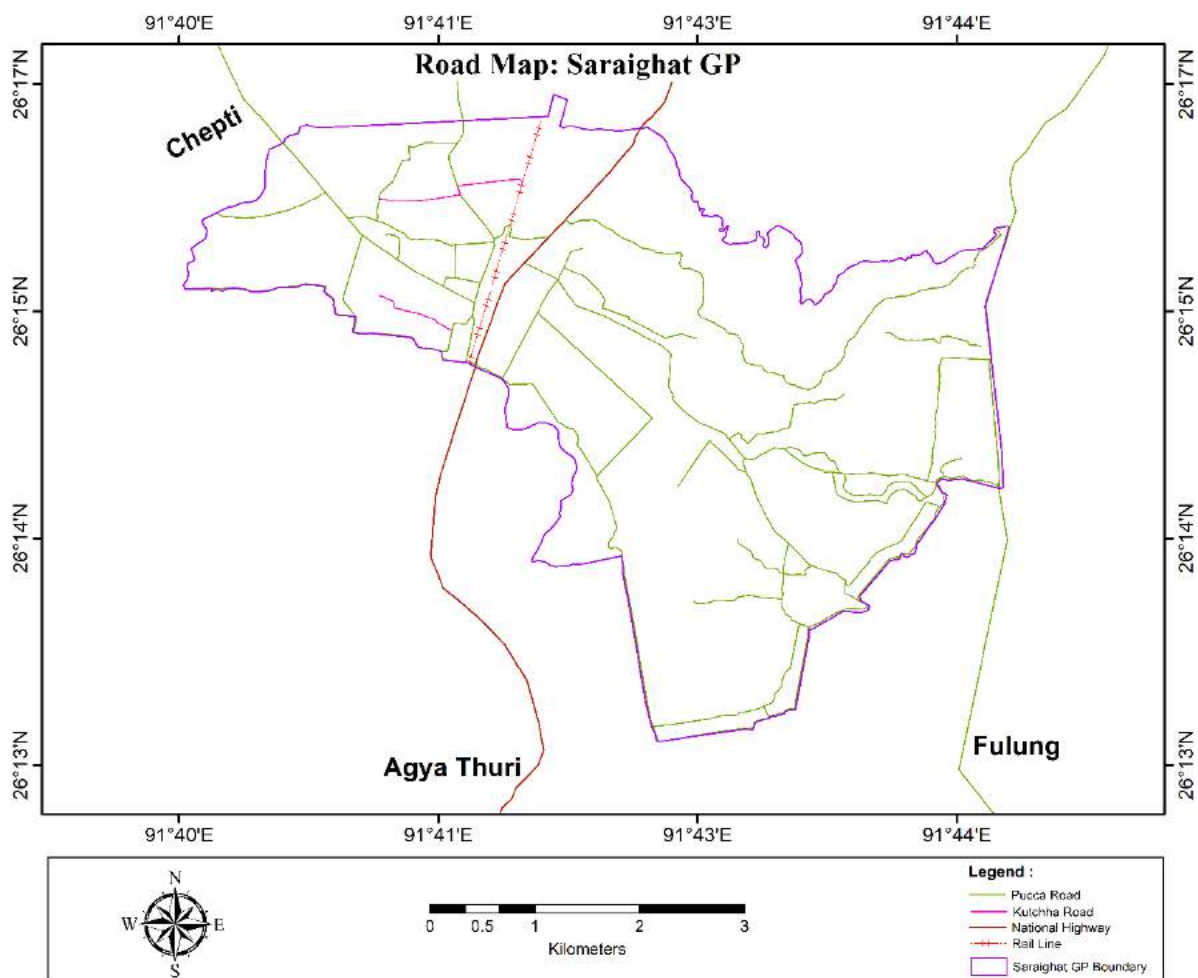


Fig 2.17 Spatial map of Saraighat Village Roads

Table 2.5 Road Transportation

Road	Length (km)
NH31	2.73
Rail	2.43
Pucca Road (total)	76.30
Kuccha Road	2.11

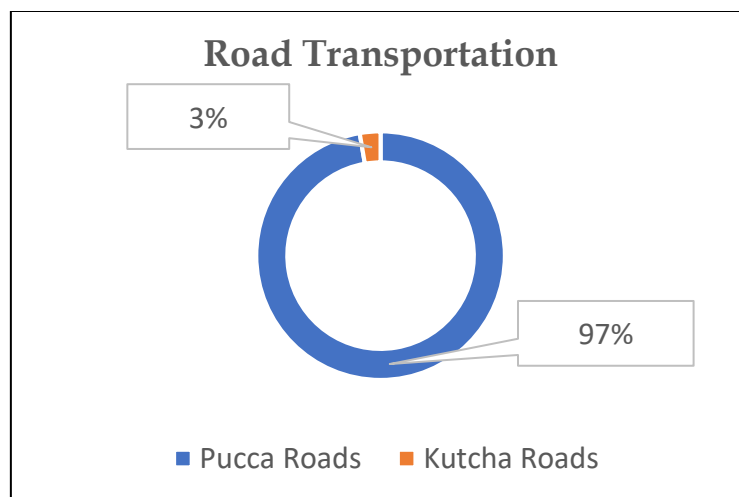
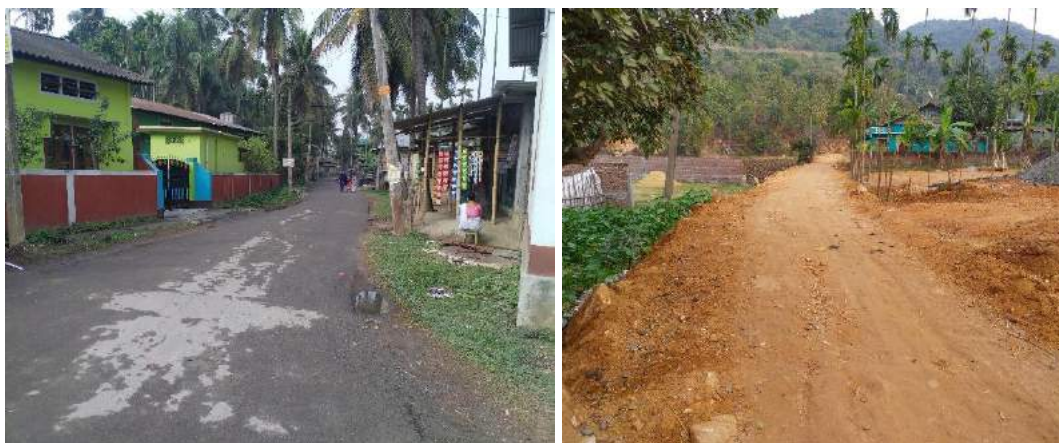


Fig 2.18 Percentage Distribution of Kuccha & Pucca Roads



a) Pucca Road

b) Kuccha Road

Fig 2.19 Village Roads

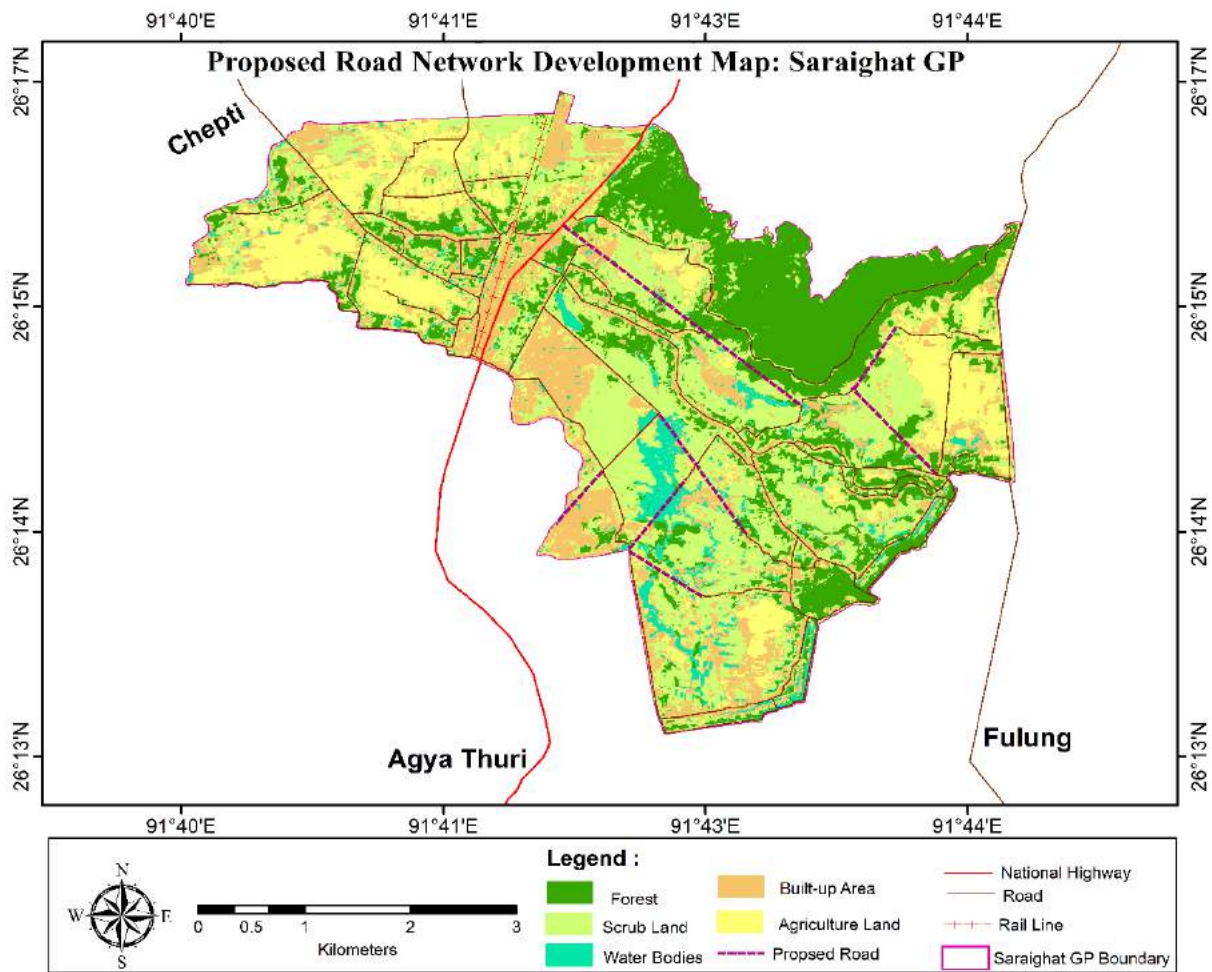


Fig 2.20 Proposed Road Network Development

Proposed Road Network Development

The Overall connectivity of Saraighat GP is quite good. The pucca roads accounts for around 97% and only 3% is kutchra roads. Taking account of future growth of population and expansion of built-up area, the secondary and tertiary roads are proposed as show in the fig 2.20. The vision is to preserve the agricultural land and vegetation.

Road Finish & Material

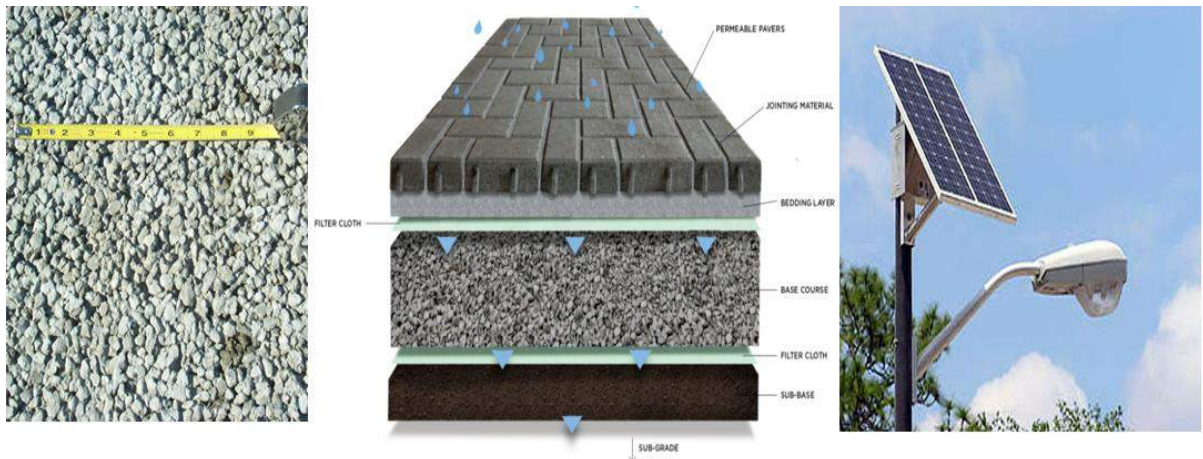
Use of **pervious concrete or pavers** for proposed pucca roads and present kutchra roads is advised, as it allows rain water absorption and helps maintain ground water.

Pavements

Need for **permeable pavements** (min 3ft wide), is advised with a 6inch rise wrt. street level along at least one side of the Tertiary roads.

Streetlights

Solar streetlights, at distance of 2.5 - 3 m to be installed along all Secondary and at distance of 4-5m for all Tertiary streets recommended, with particular provision at street corners.



a) Pervious Concrete

b) Permeable Pavements

c) Solar Streetlights

Fig 2.21: Proposed Road Development

2.3.1.3 Drainage

More than 75% village roads have drainage line and some are under construction. Flooding of the road and ponding on the road surface occurs during the rainy season, as some drainage line requires cleaning, repair and maintenance. Roads and Drainage are constructed under MGNREGS, employing local people. The drains are made of concrete, usually having cover slab. Kutcha drains are also present in some areas which requires frequent cleaning and maintenance.



Fig 2.22 Drainage System

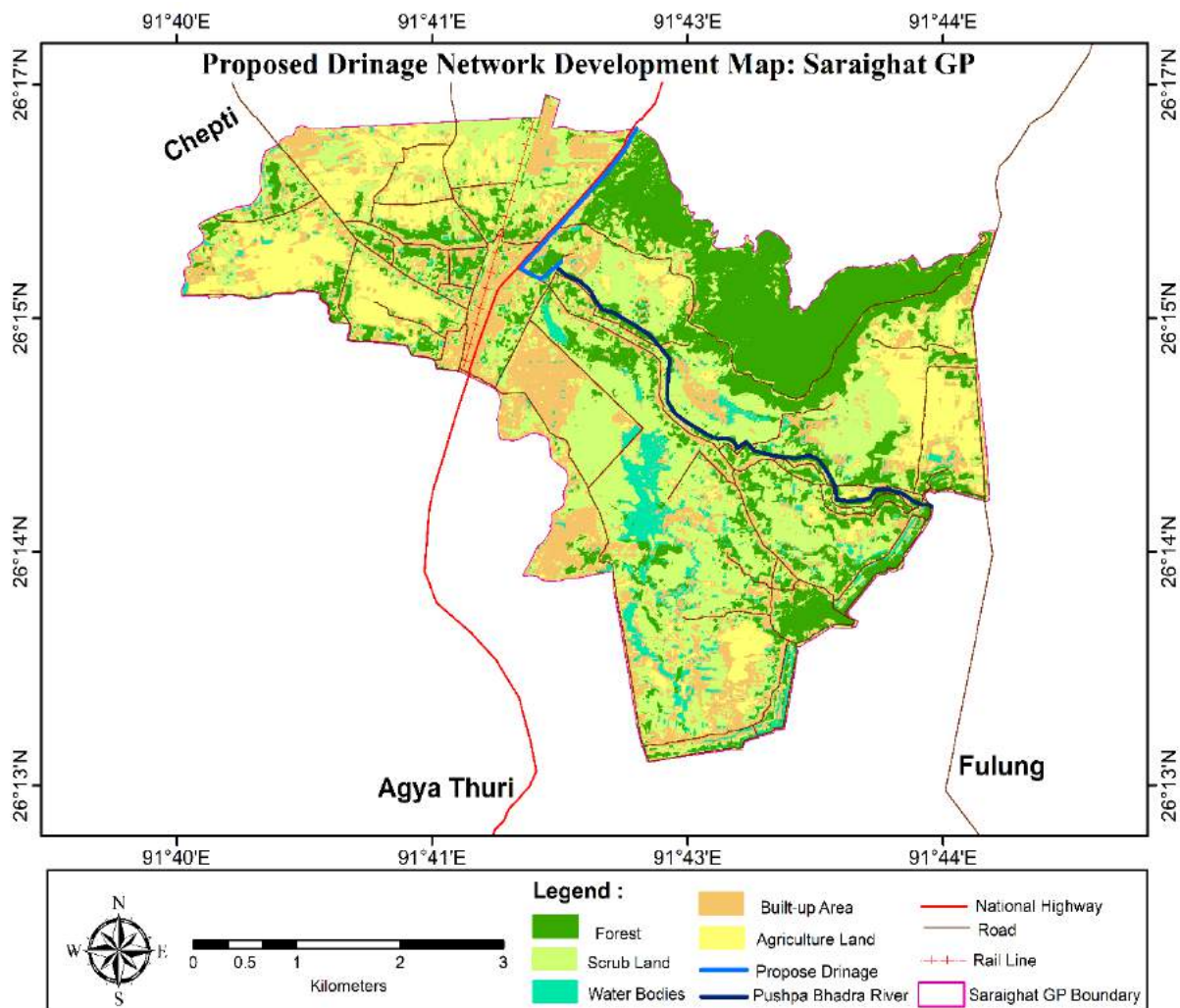


Fig 2.23 Proposed Drainage Network Development Map

The water from the GP would get accumulated in a subsided area, where now AIIMS has been setting up, and therefore due to hindrance to the flow of water, the areas are getting flooded in the rainy season and there is no proper drainage system to drain out the water. These causes stress to the agriculture cultivation, and people are now shifting from agriculture activities to other sectors. Hence, the following measures could be taken to improve the drainage network in the GP:

- ✓ The historic Pushpa Bhadra river which has got dried up in due course of time due to human activities needs to revived and can be implemented to proper drainage system (Fig 2.23).
- ✓ There is an important requirement of drainage system in the village area that has been proposed in the fig 2.23 in order to prevent from flash flood during the rainy season. There is scope for market establishment along the proposed concrete drainage line.

2.3.2. Social Infrastructure

Health

There is one state dispensary and two health sub-centre in the Saraighat GP. The following details are mentioned below:

No of Doctors: 3

Total Staff Members: 6 (1-GNM, 2-ANM, 1-laboratory technician, 1 pharmacist, 1- fourth grade worker)

Doctor to Patient ratio: 5333:1

Commonly found diseases: cough, cold, skin diseases

Main cause of diseases: it is suspected that occurrence of skin diseases may be due to nearby industry.



Fig 2.24 Health Centre

Existing Facilities

- ✓ OPD
- ✓ Laboratory for in house analysis
- ✓ 1 bed for in house patients
- ✓ Labour room (24X7)

The lab facilities are not adequate considering the doctor-patient ratio. Registration fee is free for senior citizen, BPL card holder and baby below 1 year. There is a demand that the number of rooms should be increased as there are only 4 rooms at present, causing **space problem**. A **waiting hall is required for the patients** as there is no such space that can accommodate

people during rain/severe sunlight. **Construction of drainage line** is another important requirement as it gets flooded during the rainy season. Other needs are to increase strength of doctors and staff members, to increase number of beds, ambulance services and security arrangements.

Education

- ✓ The drop-out ratio of students is almost nil. The teacher to student’s ratio stands close to 1:13.
- ✓ There is good number of existing educational institute in the GP, but the infrastructure needs to be upgraded.
- ✓ Two of the most common problem in all the schools are that there is no boundary wall that leads to theft and other mischievous activities, and unavailability proper drinking water.



Fig 2.25: Educational Institutes in Saraighat

Table: 2.6 Educational Institute

Infrastructure Facility	Present Status
Lower Primary School	12
ME School	05
High School	03
Higher Secondary	01
College	01
Art School	01
Aanganwadi	25

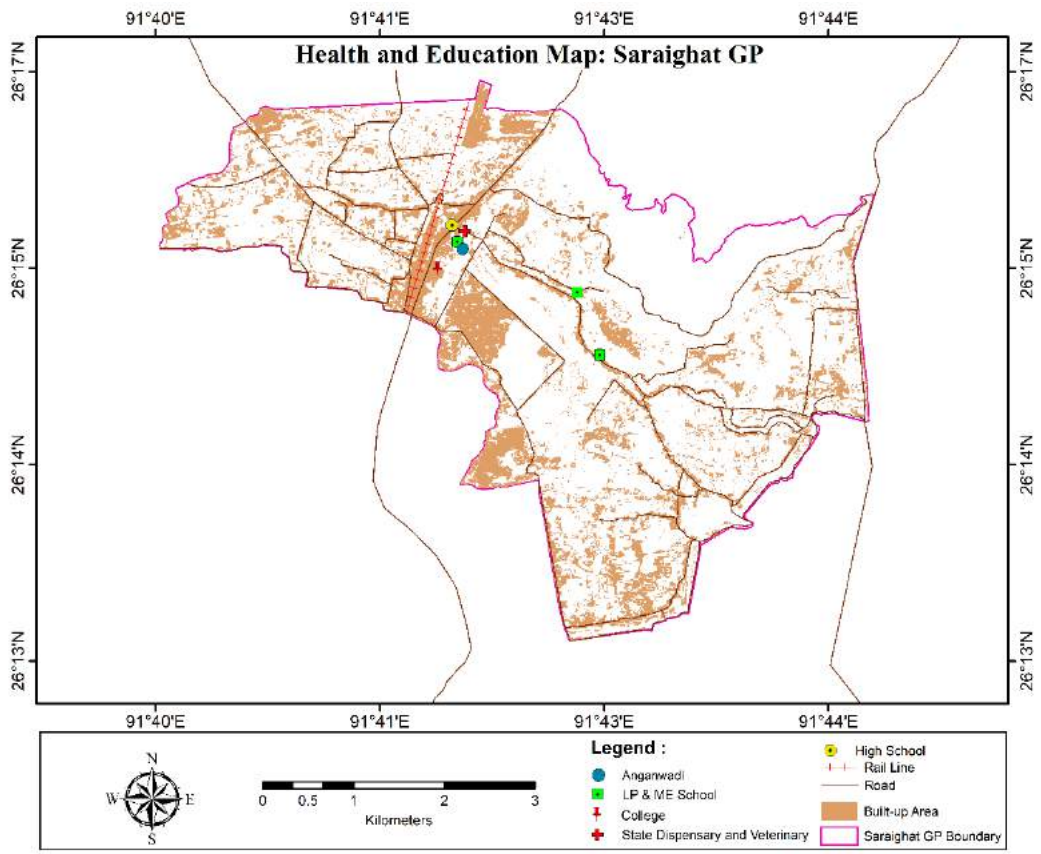


Fig 2.26: Spatial Map showing Health & Educational Institutes

2.3.3. Other Social Infrastructure

There are various other social infrastructures present in the village like post office, bank, committee hall, playground, etc. as shown in table 2.8.



a) Post Office

b) Bank

Fig 2.27: Other Social Infrastructures in Saraighat GP

Table 2.7: Other Social Infrastructure

Infrastructure Facility	Present Status
Post office	01
Auditorium	02
Bank	04
Playground	01
ATM	03
Libraries	02
Religious Places	28
GP office	01
Club	03
Govt. Department	04

2.4 Agriculture

The net cultivable area in Saraighat GP is 797 Ha, which is predominately spread in north-western part of the GP. The area under waste land is 310 Ha, basically in the south-western part of the GP. The major crops grown are Sali paddy, mustard, rabi & summer vegetables. The cropping pattern followed in the GP are as follows:

- Single crop Sali paddy
- Sali paddy followed by mustard
- Rabi vegetable, Kharif vegetable
- Mustard followed by kharif vegetable

Rice Cultivation:

- ✓ The common varieties of rice produced by the farmers are Joha, Aijung, Ranjit, Bahadur, Sonalika, etc.
- ✓ Majority of farmers are small farmers having small land holding capacity and generally perform self-sustenance type of agriculture. Farmers having larger land holding sell their produce to traders from city and other nearby places.
- ✓ No major Govt. irrigation scheme except individual Shallow Tube Wells set-up.

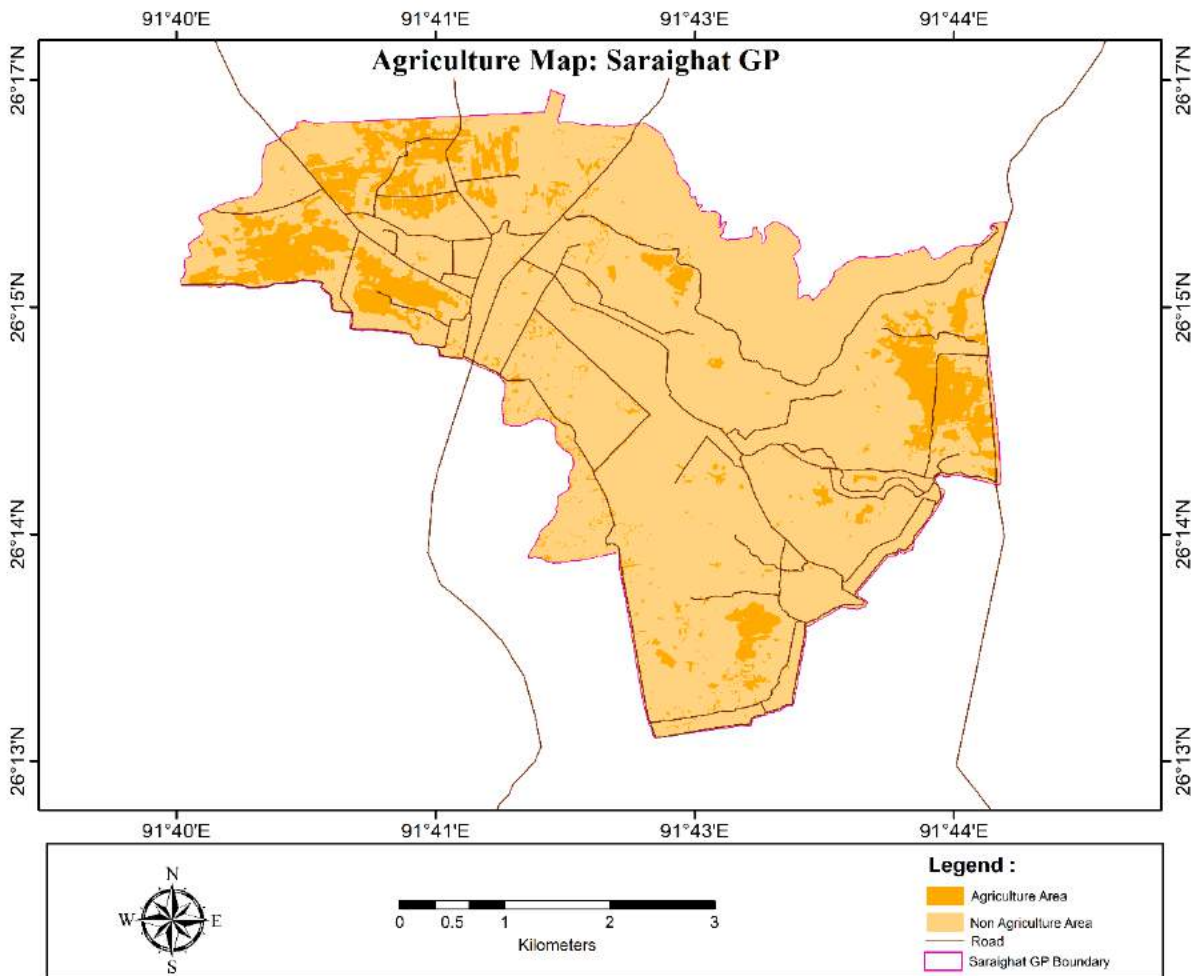


Fig 2.28 Agriculture Map of Saraighat GP

- ✓ Time to time Govt. sponsored training by Agriculture and Panchayat & Rural Development Departments.
- ✓ There is negligible use of chemical fertilizers in agriculture field. The mostly used fertilizers are FYM and vermi-compost.
- ✓ Commonly used machinery used are tractor, power tiller, thresher, sprayer, etc.



Fig 2.29 Paddy Field



Fig 2.30 Mustard Cultivation

Mustard Cultivation:

Mustard is cultivated in both single as well as double cropping intensity. The cultivation is done in household level as well as in farmland. The farmers processed their raw materials in nearby mustard oil extraction mill and sell their produce to the nearby market as well as for self-consumption.

Vegetables:

Vegetables are cultivated both in household level as well as farmland. The common vegetables grown are potato, tomato, brinjal, cabbage, cauliflower, gourds, spinach, ginger, garlic, onions, chili, etc. Out of all the vegetable crops, potato, tomato, brinjal, cabbage is cultivated in large farmland and are used for business purpose.



Fig 2.31 Vegetable Cultivation

Govt. Scheme Implemented:

- i. Inputs distribution under RKVY Scheme
- ii. Inputs and power tiller under HMNEH scheme
- iii. Tractor distribution under CMSGUY
- iv. Financial assistance under Chief Minister Krishi Sa-Sajuli Bitaran
- v. Financial assistance for purchase of Agril. Inputs, implements, under PM KISAN Yojana
- vi. Pradhan Mantri Fasal Bima Yojana
- vii. Kisan Credit card, etc.

Challenges Faced:

- ✓ Land fragmentation leads to no agriculture
- ✓ The farmers are motivated to easy earning by adopting other means of income
- ✓ There is hardly cultivation of Sali paddy through natural rainfall.

Motivation is required to group cultivation, otherwise, interested farmer are also unable to cultivate due to public grazing problem.

Organic Farming

Need for Organic farming

The need for organic farming arises from the unsustainability of agriculture production and the damage caused to ecology through the conventional farming practices. Organically cultivated soils are relatively better attuned to withstand water stress and nutrient loss. The monoculture of high yielding seeds required external inputs of chemical fertilizers. The fertilizers also destroy soil organisms. The long-term effect was reduction of crop yields. The damaged soil was easily eroded by wind and water. The eroding soil needed use of continuously increasing quantities of fertilizers, much of which was washed/leached into surface and underground water sources.



Fig 2.32 Organic Farming

Benefits of Organic Farming

i. Improvement in soil quality

It is reported that soil under organic farming conditions had lower bulk density, higher water holding capacity, higher microbial biomass carbon and nitrogen and higher soil respiration activities compared to the conventional farms, hence sufficiently higher amounts of nutrients are made available to the crops.

ii. Increased crop productivity & income

Poor farmers can improve their farm productivity and fertility while avoiding dependence on expensive external inputs. Organic farming can increase productivity and income, thus helping to improve food security.

iii. Low Incidence of Pests

Bio-control methods like the neem-based pesticides to *Ti-ichoderma* are available in the country. Indigenous technological products such as Panchagavya (five products of cow origin) found to control effectively wilt disease in tomato.

iv. Employment Opportunities

According to many studies, organic farming requires more labour input than the conventional farming system. Hence, labour unemployment and under employment will find organic farming an attraction. Moreover, the problem of periodical unemployment will also get mitigated because of the diversification of the crops with their different planting and harvesting schedules resulting in the requirement of a relatively high labour input.

v. Indirect Benefits

While the consumers get healthy foods with better palatability and taste and nutritive values, the farmers are indirectly benefited from healthy soils and farm production environment. Eco-tourism is increasingly becoming popular and organic farms have turned into such favourite spots. Protection of the ecosystem, flora, fauna and increased biodiversity and the resulting benefits to all human and living things are great advantages of organic farming which are yet to be properly accounted for.

Proposed Objectives

(i) Sustainable Agriculture (ii) Increasing Agriculture Production (iii) Food Self-Sufficiency (iv) Environmental Protection (v) Conservation of Natural Resources (vi) Rural Development.

Food Processing

The agro-climatic conditions of the region favor growing of a variety of fruits, vegetables/spices like coconut, banana, mango, jackfruit, pineapple, orange, ginger, turmeric, chillies, pepper, etc. The sector has the potential to grow at a rapid pace in Assam with the increasing demand for processed food. With better quality planting material, organic farming, adequate research support and infrastructure, the region could easily cause a major boom in horticulture and food processing sector.

With primary focus on processing of surplus of fruits, vegetables and grains produced in the region, the following crops may be targeted for processing:

- Pineapple
- Citrus – orange, lemon
- Jackfruit
- Turmeric
- Potato
- Tomato
- Banana
- Papaya
- Ginger
- Rabi & Kharif Vegetables

Table: 2.8 Food processing items

Type of Units	Major Raw Materials Required
Pulping & Concentrate	Mango, pineapple, litchi, ginger, banana, tomato
Juicing	Mango, pineapple, litchi, orange, banana, guava
Jam & Jelly	Mango, pineapple, orange, guava
Chips	Banana, jackfruit, potato
Rice mill	Paddy

Vegetables (IQF)	Kharif & Rabi Vegetables
Confectionary	Pulp, concentrate, extracts of fruits
Dairy unit	Milk
Extraction unit	Ginger, turmeric, ayurvedic inputs
Spices processing unit	Cardamom, turmeric, coriander, black pepper, ginger
Dehydration unit (dry/powder)	Mango, pineapple, orange, tomato
Vegetable oil	Kharif, Rabi vegetables
Oleoresins	Ginger, turmeric

Constraints in the growth of the sector:

Many of the problems faced by the food processing units arise primarily on account of the perishable nature of raw material, seasonal nature of their operation and low scale of operation.

Some of the specific problems are:

- ✓ Lack of efficient supply chain infrastructure and inadequate expansion of processing and storage capacity commensurate with agriculture production have been identified as the main reasons for higher wastages, higher cost of production, lower value addition in food processing sector.
- ✓ Inadequate production and availability of processable variety of raw material is a major area of concern which arises due to inadequate emphasis on developing appropriate varieties and extension activities.
- ✓ Inadequate linkage of processors, exporters and bulk purchasers with farmers resulting in mismatch between the requirements of industry and supply of agri-produce by the farmers. The problem is often compounded by legal provisions relating to restrictions on commodity storage and movement.
- ✓ Food processing units, largely operating in MSME segment, face problem in their access to bank credit due to seasonal and perishable nature of the commodities handled by these units. High cost and inadequate credit do not attract prospective entrepreneurs choosing food processing sector for investment.

- ✓ Marketing of processed food is a major problem faced by food processors particularly the micro and small processors. Given the scale of operation, individual units are unable to invest in marketing and branding impacting performance of the sector.
- ✓ Sector specific Entrepreneurship Development training and Incubation Services are weak areas inhibiting growth of the sector.
- ✓ Traditional & ethnic food products have a huge potential both in domestic and overseas market. There is a need for R&D for product, process, and technology development to support this niche segment.

Proposed Objectives

- ✓ Increase level of processing and preservation, particularly at farmer level, of perishables, to reduce wastages and increase value addition leading to higher income of farmers.
- ✓ Support the predominantly unorganized food processing segment to create employment opportunities in rural areas.
- ✓ Promote skill and human resource development to meet the increasing needs of the sector.
- ✓ Support processors in facilitating procurement, storage, movement of raw materials and promoting voluntary compliance of regulatory requirements.
- ✓ Generate more opportunities in agribusiness and food processing industry with a special focus on women.

Strategies to address the problem of food processing sector:

- ✓ Promotion of cluster approach as the key strategy for intervention in the food processing sector with emphasis on strengthening and creation of integrated supply chain infrastructure to minimize wastages.
- ✓ Incentivize expansion of capacity and upgradation of technology for processing and preservation particularly for perishables.
- ✓ Promoting employment by incentivizing FPOs to engage in Agri-business and food processing and empowering farmers graduating to agri-entrepreneurs.
- ✓ Accelerate investment in food processing sector through collaboration between GOI, State Governments and other stake holders.

- ✓ Creating awareness on food quality & safety, training manpower for ensuring regulatory compliance, promoting voluntary compliance to regulatory standards through regime of self-certification and self-regulation.
- ✓ Strengthening of Institution operating in food processing segment for advancement of learning, dissemination of knowledge, entrepreneurship and skill training to meet the growing demand of the sector
- ✓ Support for R&D activities in products & processes, facilitate dissemination of latest innovation & technology for adoption, promoting best practices in food production, processing, packaging, storage and transportation.

2.5 Animal Husbandry

Piggery Farm:

- ✓ There are around 20 piggery farms in the GP.
- ✓ Using traditional method in piggery farm.
- ✓ Large number of pigs are exported to Shillong and some of them are sold in the nearby market.



Fig 2.33 Piggery Farm

Strategy for Piggery Development

- ✓ Strengthening of Govt. pig Farms for demonstration of good pig husbandry practices and production of quality piglets for rearing at farmers field.
- ✓ To support the economically weaker section including women as a source of additional income by forming PRG and FPO, and thereby improving their livelihood condition.
- ✓ To establish linkage with market for better price realization.
- ✓ Scaling up production by minimizing preventable diseases, parasitic infestation etc.

2.6. Natural Resource

Soil

The soil types found in Saraighat GP are alluvial soil, Peaty and Marshy Soil, and Forest and Hill Soil, which are loamy in texture. The Alluvial, and Peaty and Marshy Soil, supports growth of wide variety of crops such as rice, sugarcane, jute, potato and other vegetables.

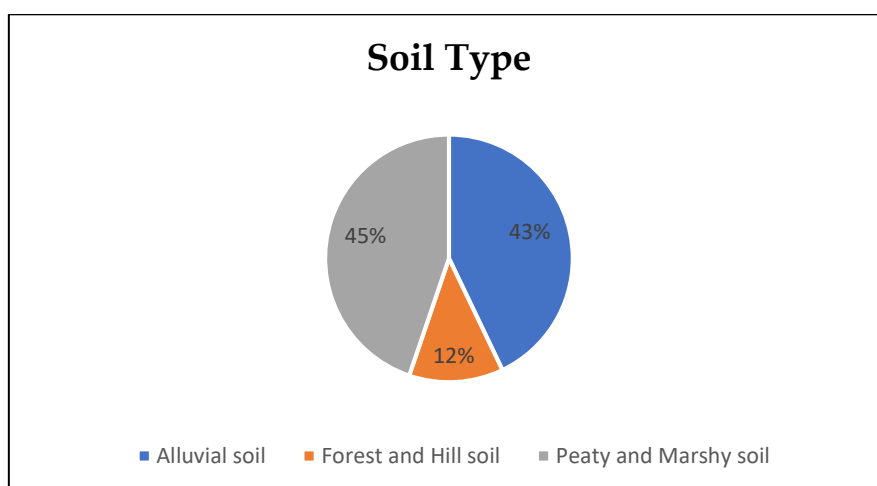


Fig 2.34 Soil Type

Table 2.9 Soil Characteristics of Saraighat GP

Soil Type	Soil Depth	Surface Texture
Alluvial soil	Deep (>100cm)	Loamy
Peaty and Marshy Soil	Deep (>100cm)	Loamy
Forest and Hill Soil	Deep (>100cm)	Loamy



a) Water supply system in school under construction

b) PHED

c) Tube well

Fig 2.35 Water Supply System

Water

- Around 65% household gets benefitted from tap water
- Around 95% household have tube wells and 2% people have well.
- There are three water PHED in the GP.
- People generally use commercially available filters for filtration purpose.

Proposed Strategy

The objective is to improve rural water supply and sanitation services through progressive decentralization, community participation and enhanced accountability.

- Placing GPs and communities in the central role, supported by higher levels of PRIs, the State government and the local non-governmental and private sector, for facilitating, planning, implementing, monitoring and providing a range of O&M back-up services.
- Using sustainable, community or local government managed models for intra- GP RWSS schemes and using State-PRI partnership models for multi-GP schemes.
- Moving the RWSS sector to recovery of at least 50% O&M and replacement costs and initiating contribution to capital costs keeping affordability and inclusiveness in mind.
- Moving towards metered household connections, with 24/7 water supply where feasible, as a basic level of service.
- Integrating water supply and sanitation, with effective sanitation promotion programs for achieving “clean villages”.
- Establishing M&E systems with independent reviews and social audits.

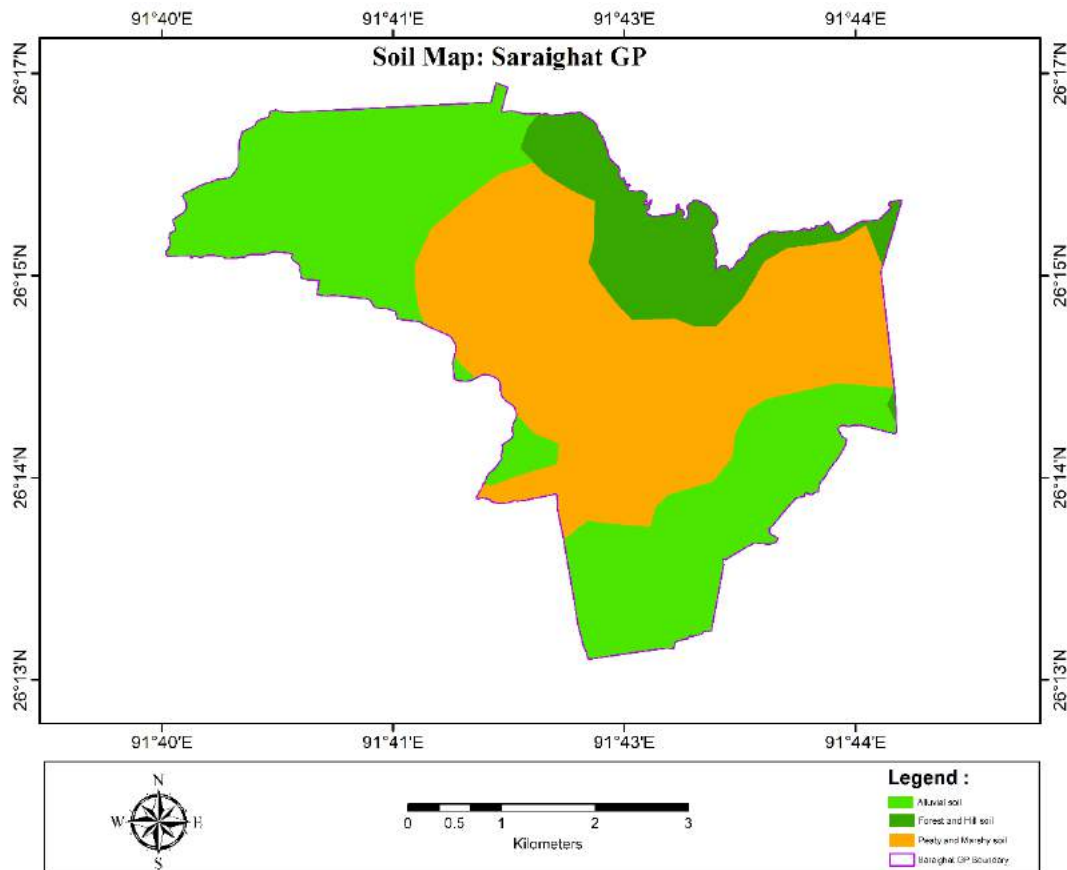


Fig. 2.36 Soil map of Saraighat GP

Ground Water Quality:

Chloride Content

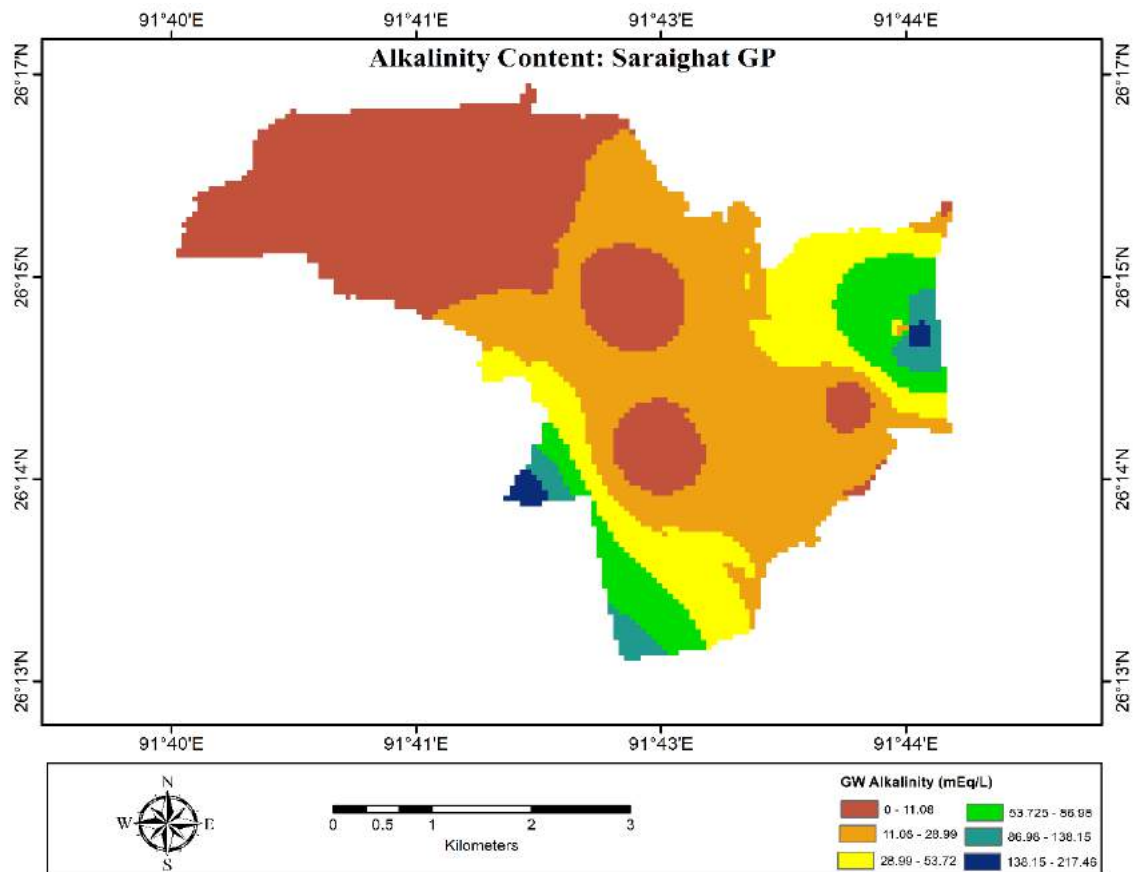
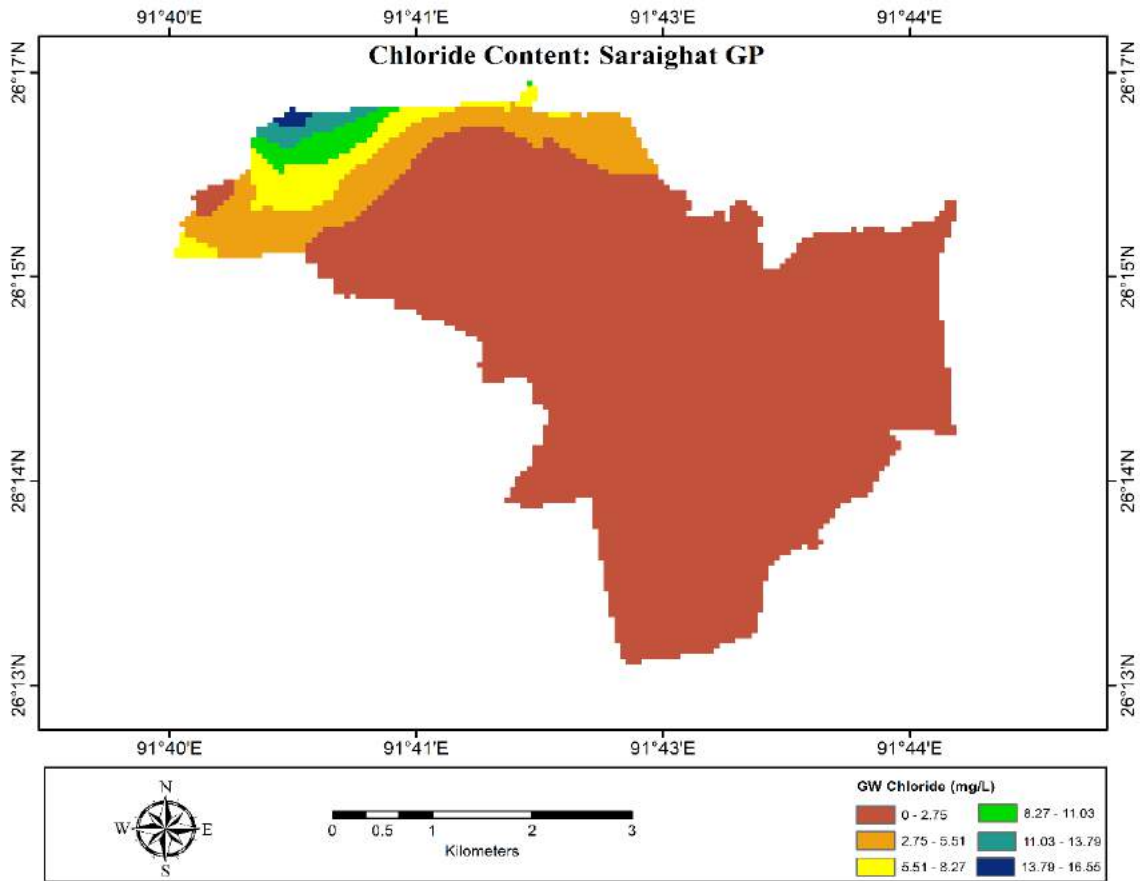
It has been observed that the concentration of Chloride in GW varies from 0 mg/L to 16.55 mg/L with mean of 44.10 mg/L. As per Indian Drinking Water Standard IS 10500: 2012, the permissible limit is 250 mg/L and the maximum limit is 1000 mg/L.

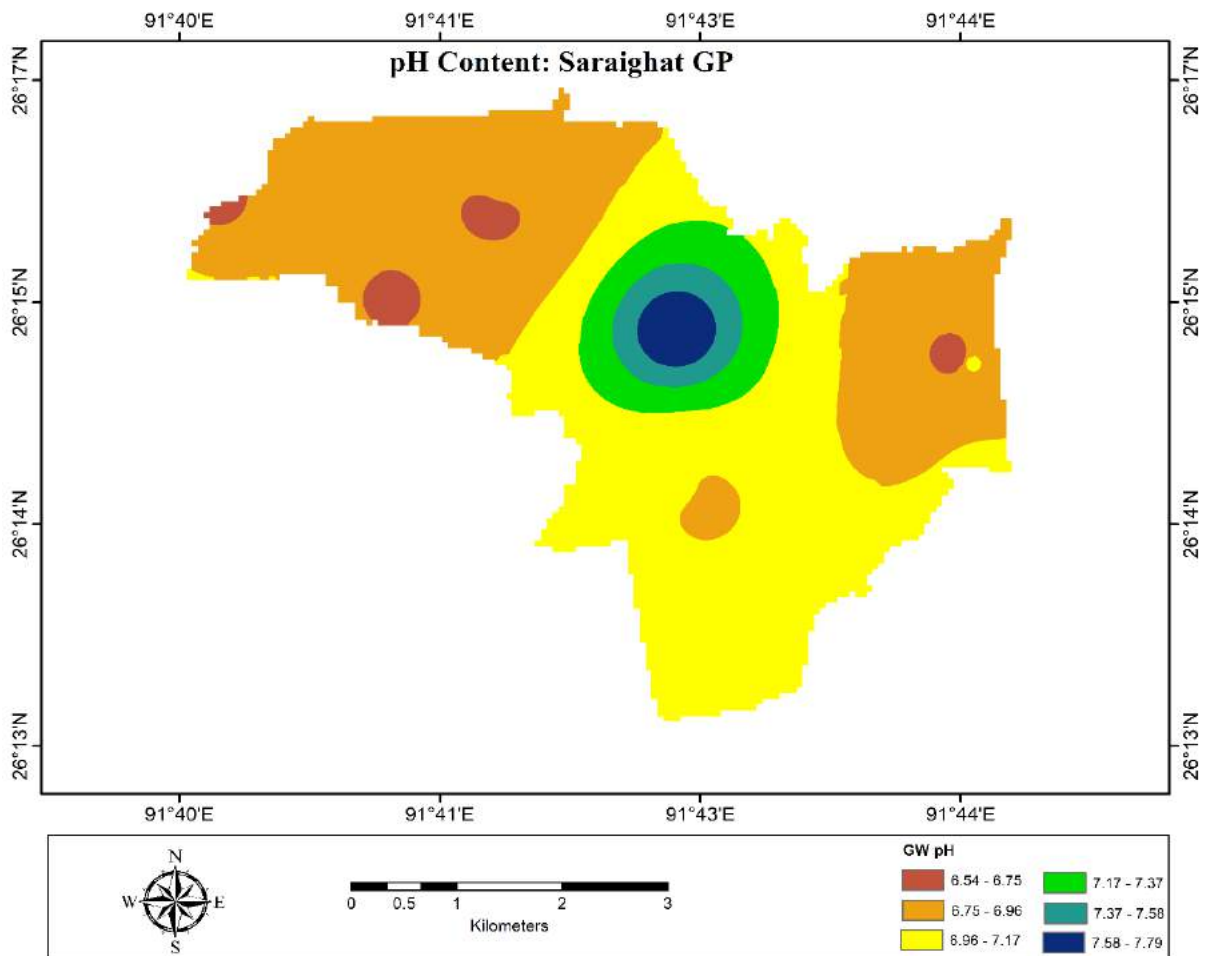
Alkalinity

It has been observed that the concentration of Alkalinity in GW varies from 0 mEq/L to 217.46 mEq/L with mean of 89.4 mEq/L. As per Indian Drinking Water Standard IS 10500: 2012, the permissible limit is 200 mg/L and the maximum limit is 600 mg/L.

pH content

It has been observed that the concentration of pH in GW varies from 6.54 to 7.79 with mean of 8.36. As per Indian Drinking Water Standard IS 10500: 2012, the permissible limit is 6.5 to 8.5 and there is no relaxation in maximum limit.





Iron Content

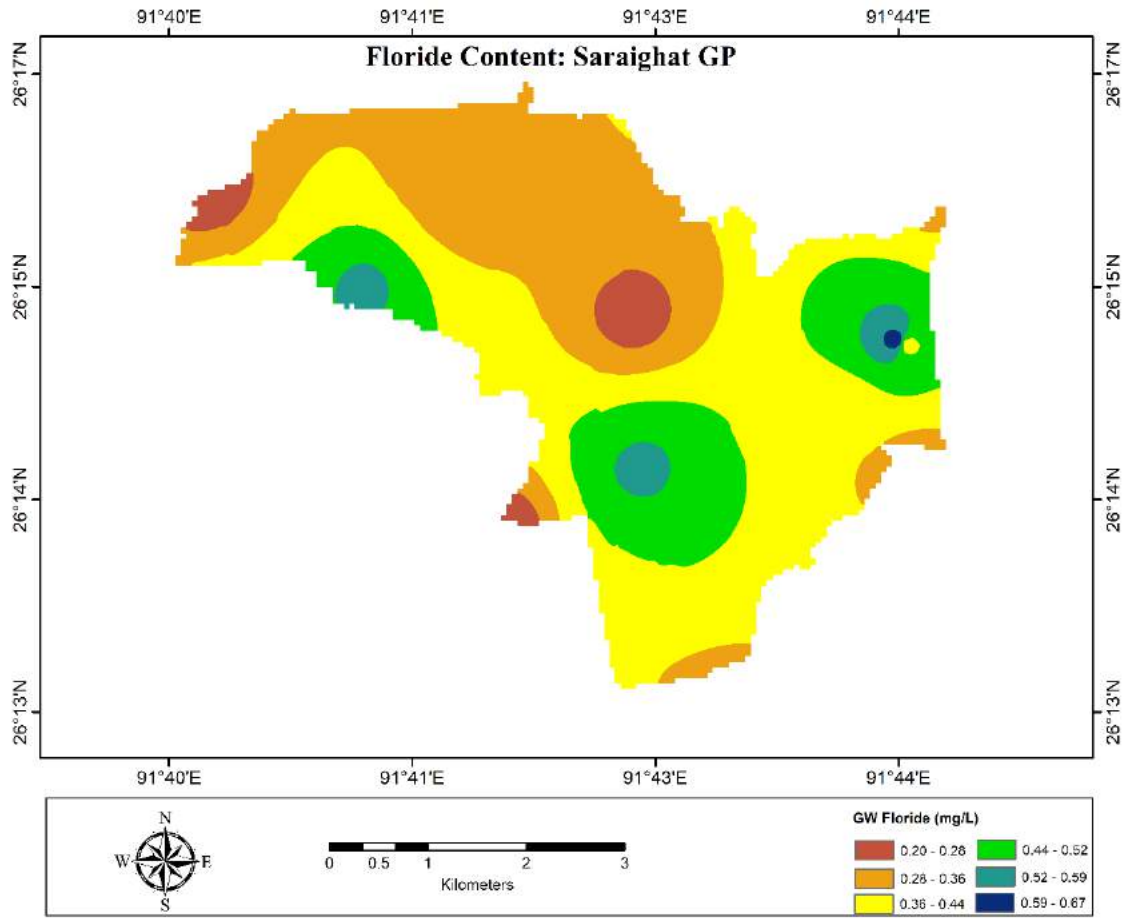
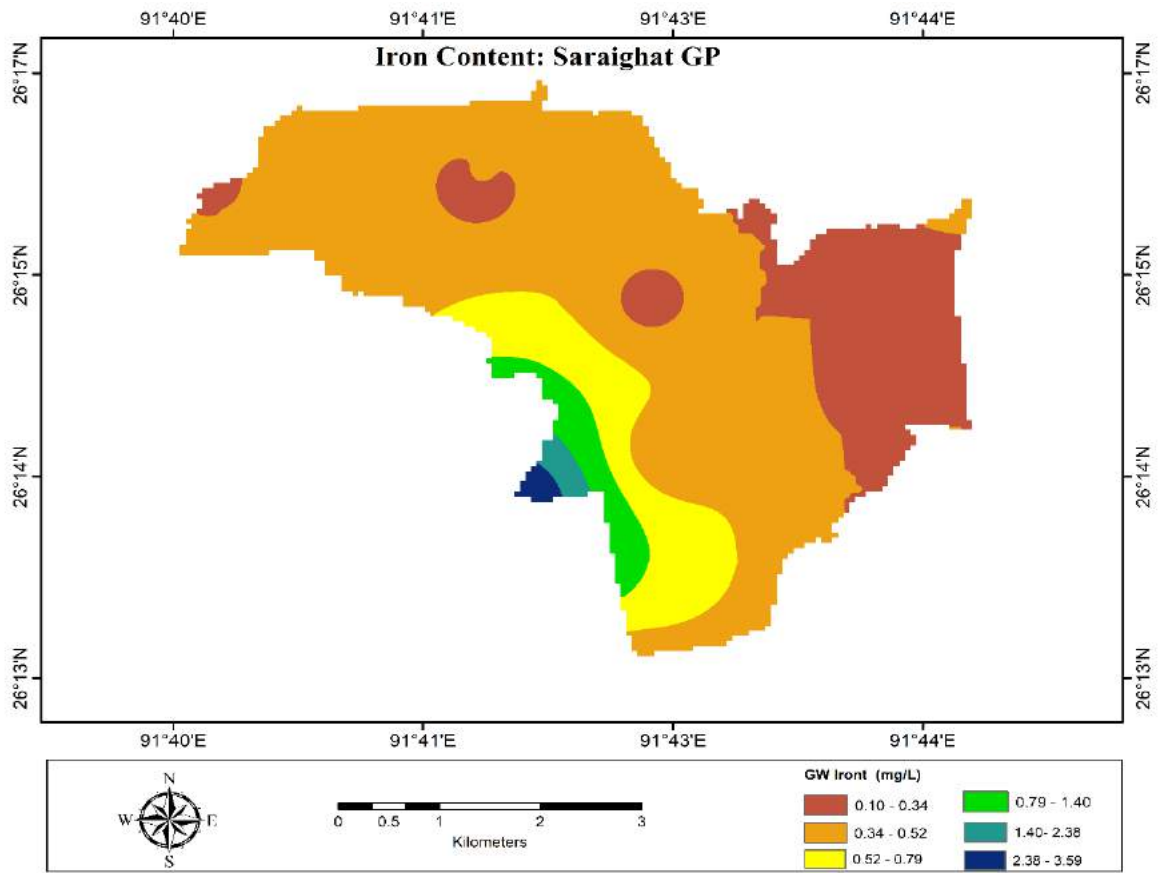
It has been observed that the concentration of iron in GW varies from 0.10 to 3.59 mg/L with mean of 1.52 mg/L. As per Indian Drinking Water Standard IS 10500: 2012, the permissible limit is 0.30 mg/L and there is no relaxation in maximum limit. Hence, necessary measures need to be taken to deal with the concentration of Iron.

Fluoride Content

It has been observed that the concentration of Fluoride in GW varies from 0.20 mg/L to 0.67 mg/L with mean of 0.04 mg/L. As per Indian Drinking Water Standard IS 10500: 2012, the permissible limit is 1 mg/L and the maximum limit is 1.5 mg/L.

Groundwater Hardness

It has been observed that the concentration of hardness in GW varies from 3.75 mg/L to 311.73 mg/L with mean of 157.74 mg/L. As per Indian Drinking Water Standard IS 10500: 2012, the permissible limit is 200 mg/L and the maximum limit is 600 mg/L.



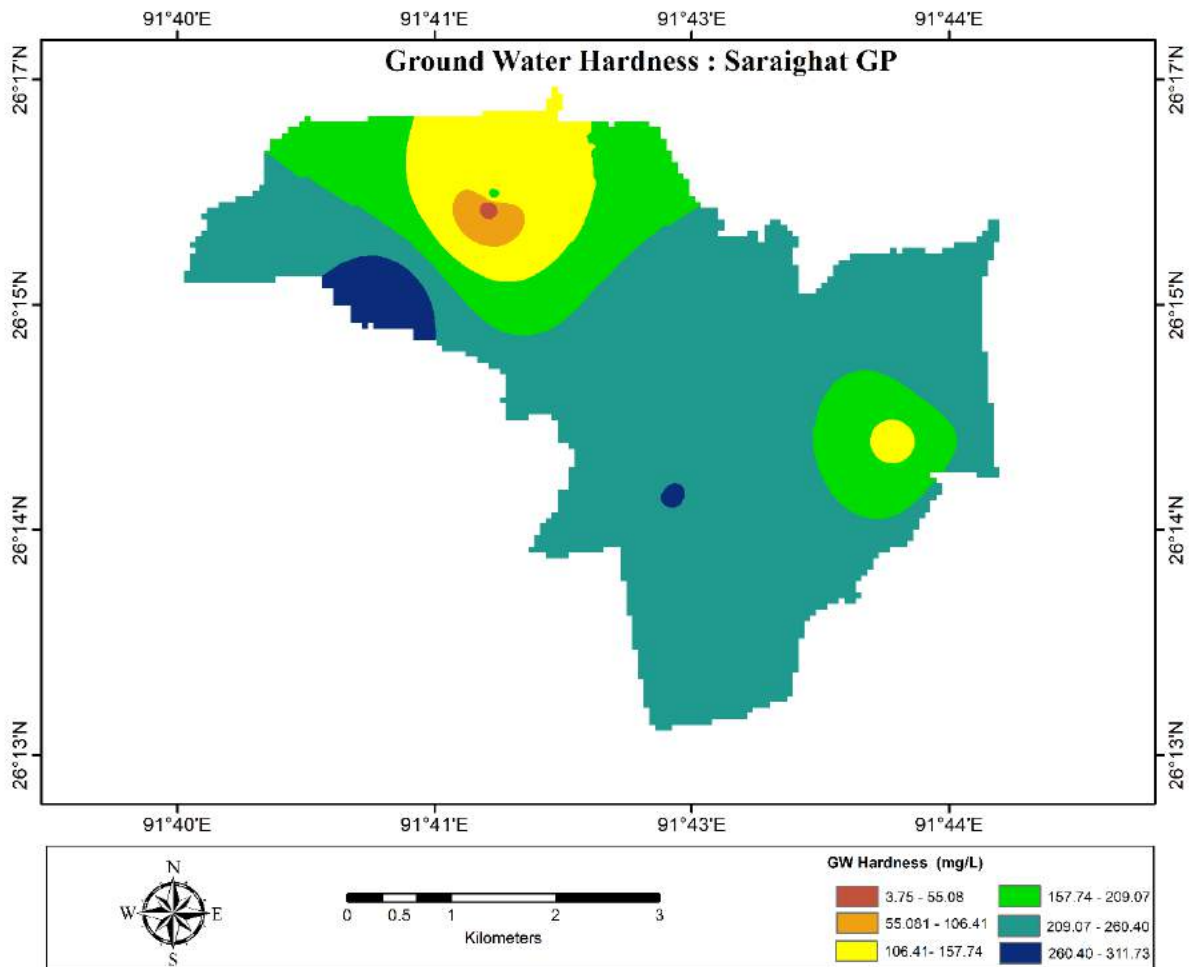


Fig 2.37 Groundwater Quality Map

2.7 Proposed Reclamation of Scrubland

Major portion of the GP, i.e., around 33% of the total area of the GP is covered with scrub land. These scrublands have potential to be used for integrated farming comprising of various components. Integrated farming system is a resource management strategy to achieve economic and sustained agricultural production to meet diverse requirement of the farm household while preserving the resource base and maintaining high environmental quality. An intensive integrated farming system addresses issues like-

- ✓ Reduction in risk with the monoculture activities and promoting enterprise diversification. Development of alternative income sources with efficient utilization of farm resources.
- ✓ Better management of important farm resources like land, labor and capital etc.

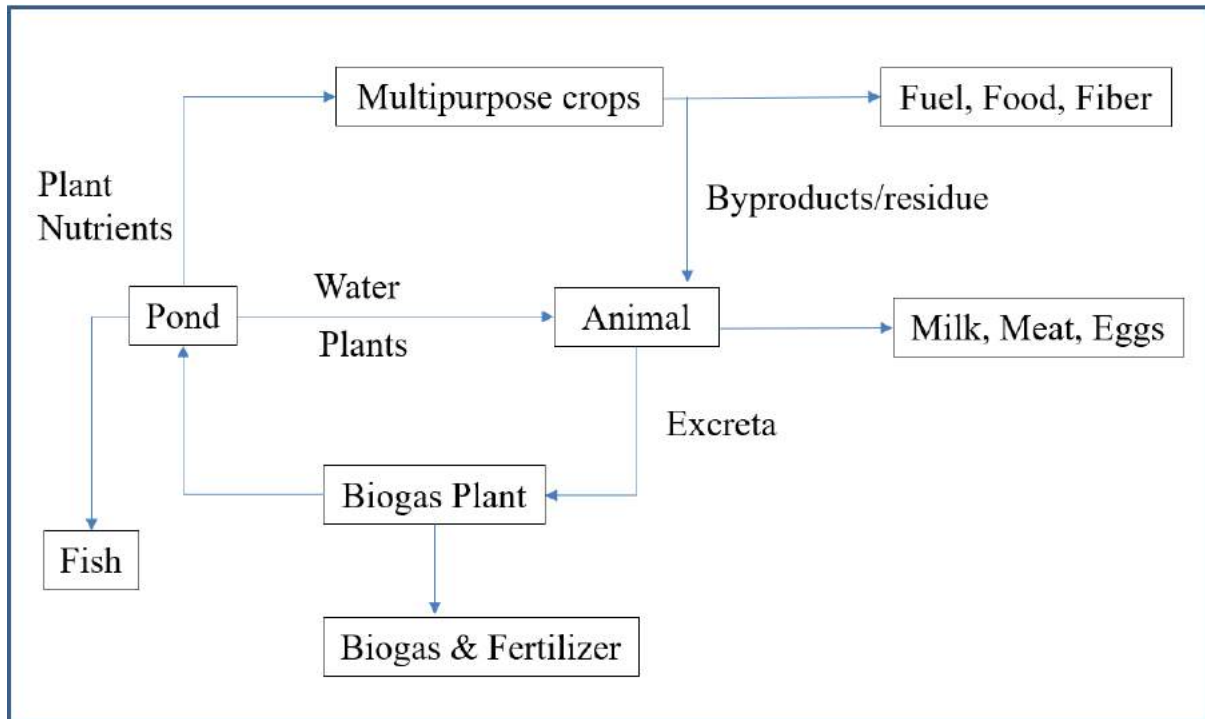


Fig 2.38 Outline of integrated farming system

- ✓ Provides an opportunity for effective recycling of the product and by-products, helps to generate flow of cash to the farmers round the year by way of disposal of milk, fruits, fuel, manure etc., beside other agricultural output.

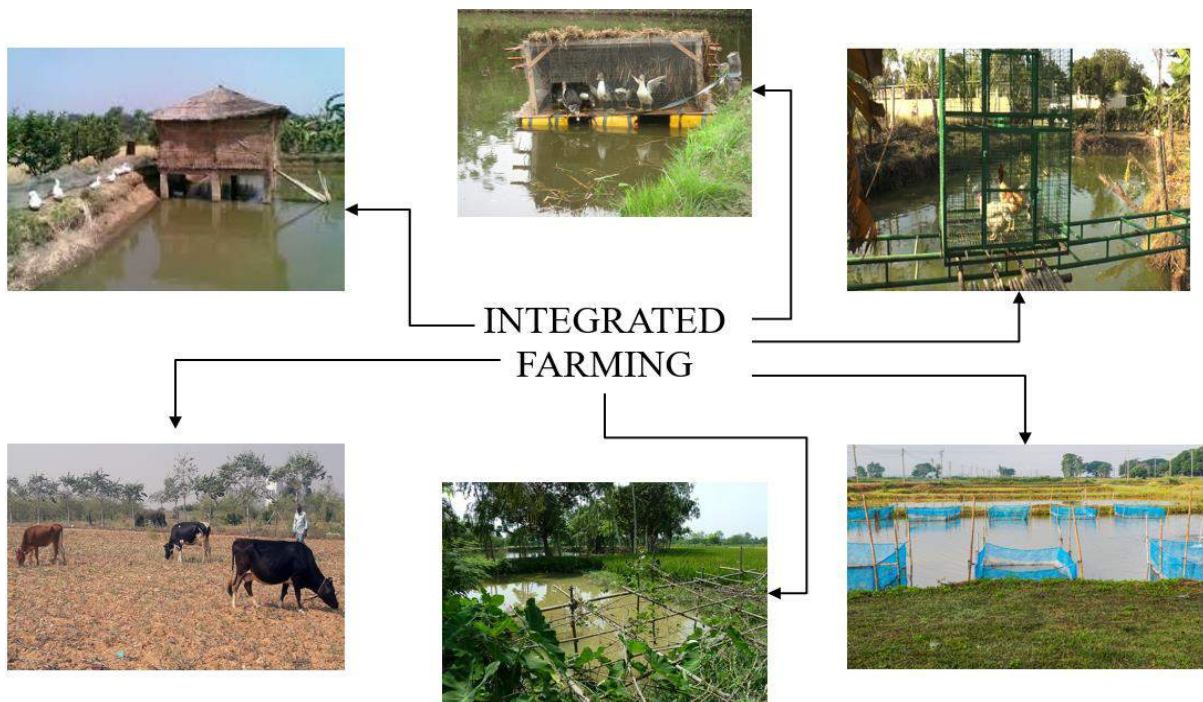


Fig 2.39 Integrated Farming

2.8 Cultural Heritage

The historic fort known in Assam as Lachit Garh, which is located in the south western boundary of the GP, was constructed under the Ahom kingdom during the times of powerful commander-in chief, Lachit Borphukan around the year 1670 CE.

This site bears a unique and exceptional testimony to a cultural tradition or to a civilization which is living. It is an outstanding example of valour performed towards the duty vested upon him to save the nation from the invaders. It represents strategic military and diplomatic location of Ahom Kingdom in respect to cruel, expansionists Mughal.



Fig 2.40 Lachit Garh

Due to lack of systematic conservation and protection facility the sites have been degraded. The site could have been upgraded with following recommendations:

- ✓ This heritage site has potential to be developed as archaeological tourism spot.
- ✓ An art gallery representing architectural or technological ensemble or landscape
- ✓ A community recreational park demonstrating traditional human settlement, land-use, culture (s), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change

The Stone Bridge

The historic stone bridge, generally believed to be the only stone bridge in Assam, i.e., the one that was over a channel of the Baranadi, was located near to the north-western part of the GP. There is a good sketch and an account of this bridge published in 1851; but the bridge itself was destroyed by the great earthquake of 1897.

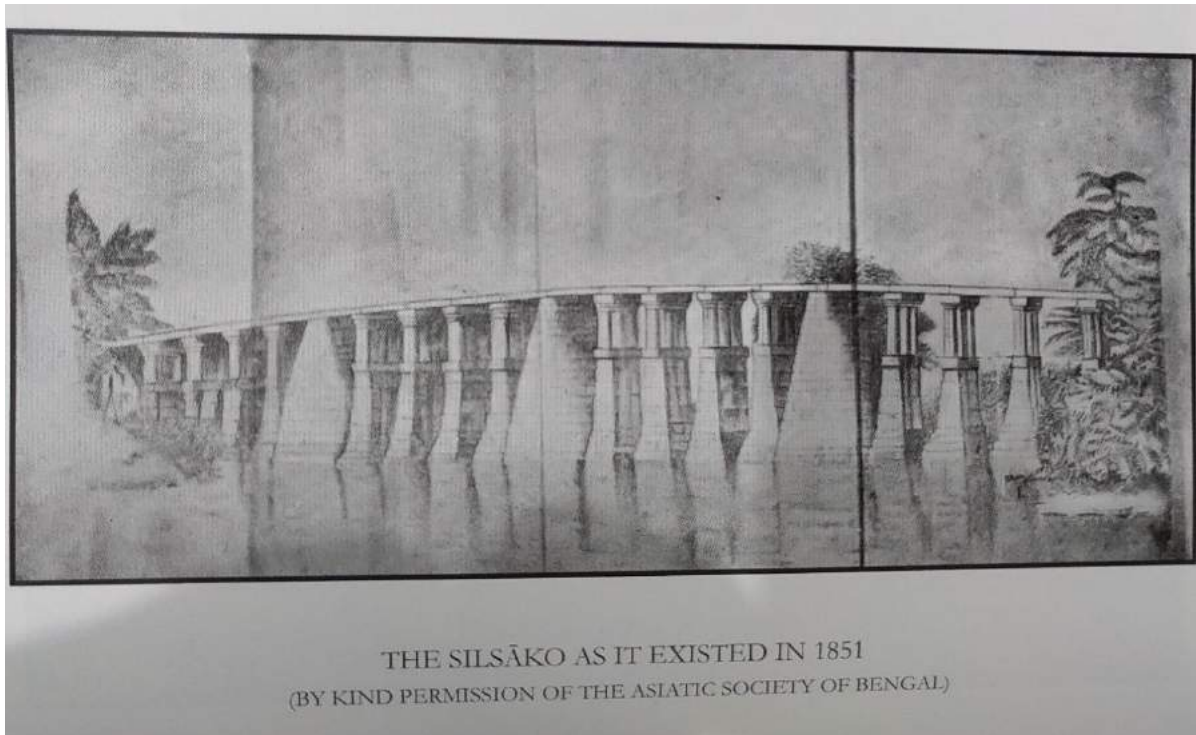


Fig 2.41 Stone Bridge of Baranadi

The stones of this great historic bridge have still been kept in the “Naamghars” of the GP. There is a scope for open museum in the GP, that would help develop cultural and heritage tourism in the area.

2.9 Saraighat as Handloom and Textile Hub

Saraighat has a great textile tradition. The women of the GP irrespective of caste and social status, have been weaving the daily requirement of their cloths and apparels and have been taking pride in her works. This weaving tradition has been handed down from generation to



Fig 2.42 Handloom & Textile Centre

generation by the women folk, who excelled in the production of extremely beautiful designs in the looms. Weaving in silk along with cotton yarns has been practised in the GP since long and all the three major silks viz. muga, eri and mulbary were known to the Assamese weavers and rearers. The objective is to make Handloom Textiles sector a sustainable source of employment and to patronize handloom products as great harbinger of cultural heritage of the state and motivate both weavers and users to take pride in manufacturing and wearing handloom products of the region.

Proposed Strategy

- ✓ To build capacity of the weavers and artisans engaged in manufacture of hand-woven products through skill up-gradation design & product innovation and infrastructural support.
- ✓ To promote investment, both private and institutional, in the sector for production of high-quality handloom fabrics to cater to the demands of the market.
- ✓ To update the weavers and artisans about the latest techniques of weaving and about modern trend of apparel and garmenting for enhanced quality and volume.
- ✓ Setting up of Common Facility Centres for environment friendly dyeing, testing, sourcing market information and for buyer seller interaction.
- ✓ To bring a sense of professionalism among the weavers and artisans, creation of facilities for easy and quick marketing of hand-woven products will be necessary.
- ✓ Marketing of handloom products in Handloom Expos, Melas etc. both within and outside may be organized with both state and central Govt. assistance.

2.10 Solid Waste Management Plan

Huge amount of waste is produced from industries, household, agriculture, animal husbandry, etc. Considering the waste produced, the dustbins and landfill location has been identified and proposed as shown in the Fig 2.44.



Fig 2.43 Dumpsite

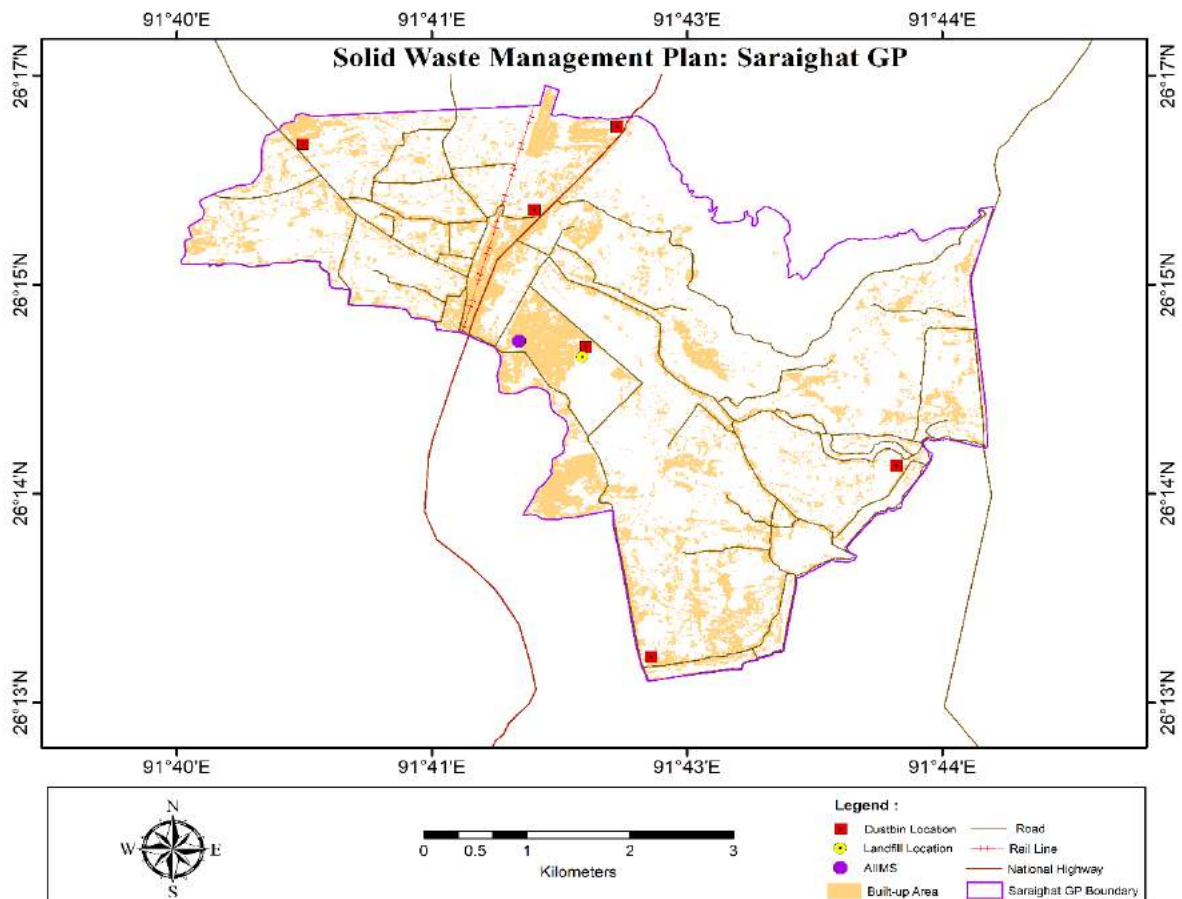


Fig 2.44 Proposed Dustbin and Landfill Location in Saraighat GP

Agricultural Waste Management

Since, rice is the staple crop in the region, majority of agricultural waste produced in the region is from rice field. With developments in the technologies for its collection and utilization, rice straw to be used for better purposes such as for mushroom and energy production and for cattle feed.

Non- energy use of rice straw

1. Using rice straw for mushroom production

Mushroom cultivation is a profitable agri-business endeavor that produces food from rice and wheat straw while facilitating the proper disposal of this by-product in an environmentally friendly manner.

The paddy straw mushroom, is considered to be one of the easiest mushrooms to cultivate because of its short incubation period of 14 days. On the other hand, cultivation of the oyster mushroom offers an on-farm technology for the bioconversion of poor-quality straw into nutritious food products. Mushroom cultivation can be a good source of income for the villagers as it has good demand and potential market in the region.



Paddy straw mushroom



Oyster mushroom

Fig 2.45 Mushroom production

2. Using rice straw for livestock feed

Using rice straw for cattle feed is common in India. The rice crop should be cut as close to the ground as possible if the straw is to be fed to livestock as of the parts of rice straw, the stems are more digestible as they have lower silica compared to the leaves. Nutrient amendment is often done by treating the rice straw with urea, which is safer and more practical to use than anhydrous or aqueous ammonia.

3. Biochar production and utilization

Using rice straw to produce biochar has huge potential. Biochar, a carbon-rich product, is used as soil amendment to improve soil productivity, carbon storage, and filtration of percolating soil water. Despite its huge potential, however, the processing of biochar requires energy for carbonization and for transportation of rice straw and biochar products. Until now, there is still a need for studies that demonstrate the feasibility of biochar production from rice straw in terms of energy balance and economic benefits.



Fig 2.46 Livestock feed



Fig 2.47 Biochar production

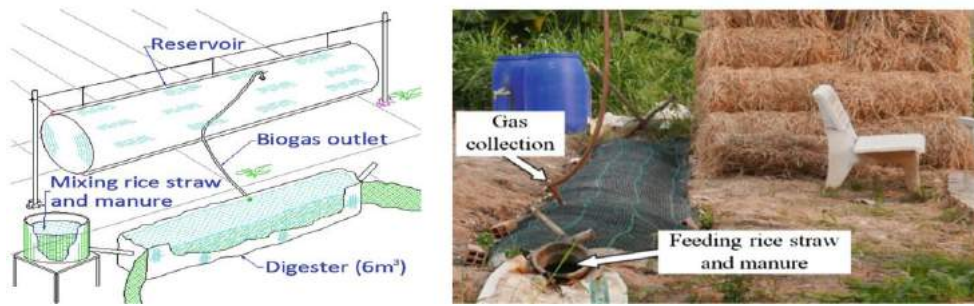


Fig 2.48: Anerobic Digestion of Rice Straw for Biogas Production

Using rice straw for anaerobic digestion (biogas production)

Anaerobic digestion (AD) is a potential small-scale energy conversion technology for rice straw which is used to generate biogas fuel for cooking, heating air for drying, or for generating electricity.

The ratio of the layers of rice straw to cattle dung is 4:1, based on the weight with the specified moisture content (MC). Feedstock with 1.6 tons of chopped straw (15–18% MC) and 0.4 ton of cow dung (30–40% MC) is fed into a batch digester with a retention time of 100–120 days.

Biogas is generated on the 7th day after feeding, with average yield of 4–5 m³ biogas per day in about 100 days. Methane content is about 65%. In addition to the outputs, about 0.4 ton of digestate is obtained and used as organic fertilizer.

Considering the amount of waste produced from the rice field in the form of rice straw and abundance of cattle dung in the village, small scale anaerobic digester is feasible in the village.

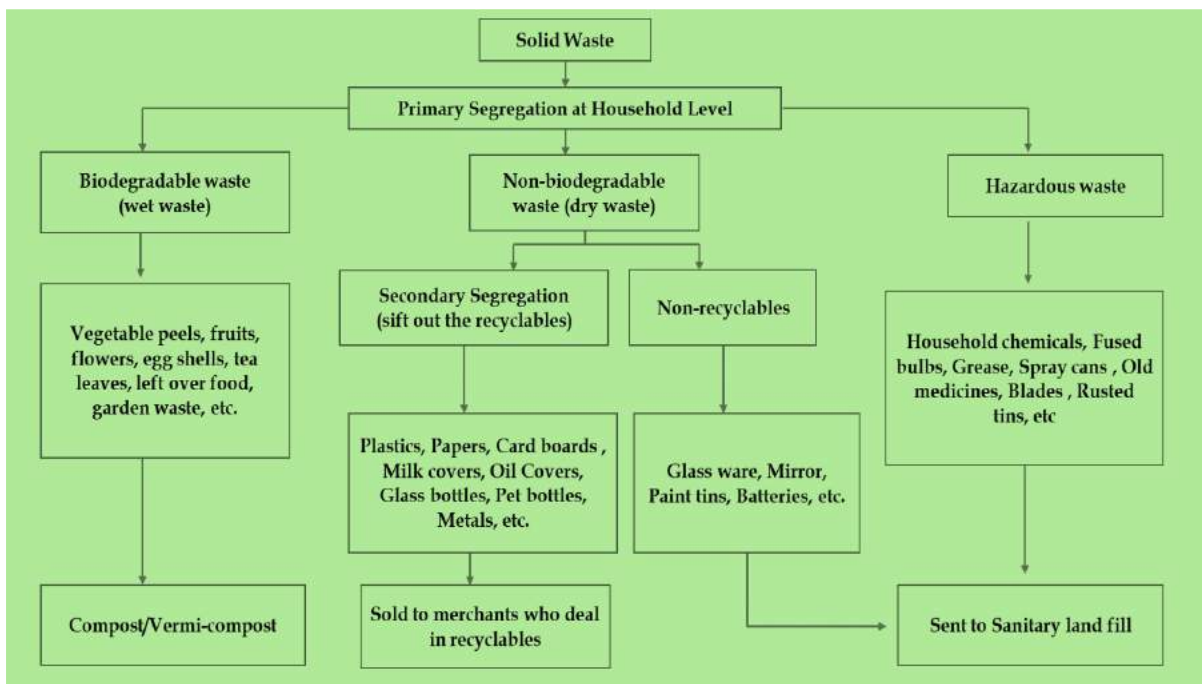


Fig 2.49 Solid Waste Management Plan

2.11 Growth Projection

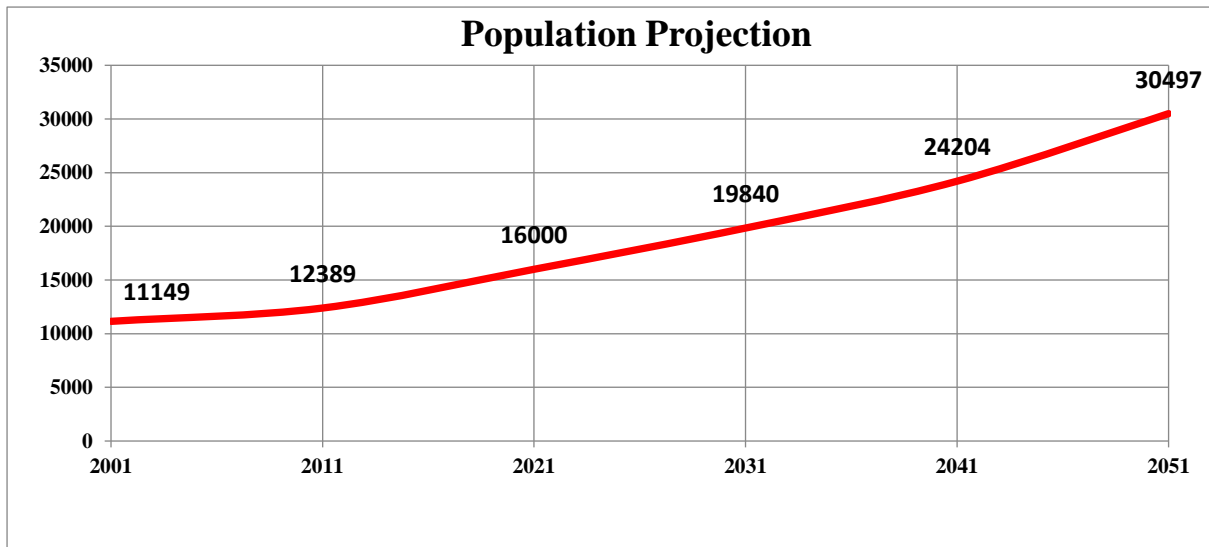


Fig: 2.50 Population projection of Saraighat GP

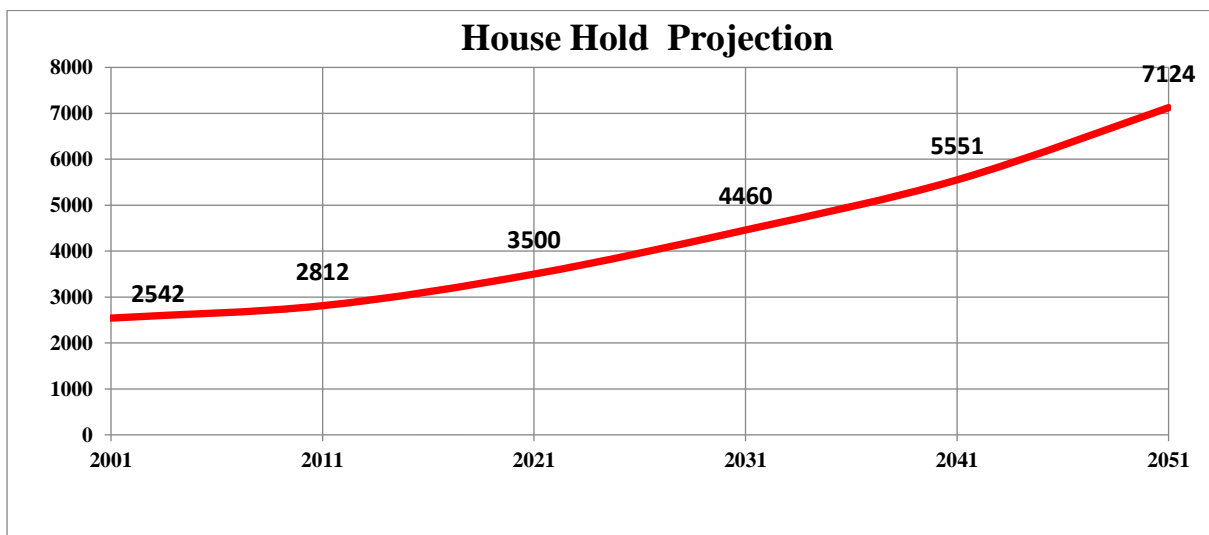


Fig: 2.51 Household projection of Saraighat GP

2.12 Survey Analysis

With the help of baseline survey and data collected from the GP, survey analysis was done and major concerns and potential of the GP are presented in the Table 2.10.



Table 2.10. Survey Analysis





Concerns	Potential
<ul style="list-style-type: none"> ✓ Major percentage of agricultural land is getting converted to scrub lands 	<ul style="list-style-type: none"> ✓ Scrublands can be used for integrated farming with components like pisciculture, apiculture, duckery, etc.
<ul style="list-style-type: none"> ✓ The farmers are motivated to easy earning by adopting other means of income, rather than agriculture 	<ul style="list-style-type: none"> ✓ There is scope for increasing the income of the farmers through technical intervention and value-added products
<ul style="list-style-type: none"> ✓ Two main concern of educational institute: <ul style="list-style-type: none"> ○ Availability of Drinking Water ○ Boundary Wall 	<ul style="list-style-type: none"> ✓ Scope for infrastructural and technological upgradation of the existing educational institute
<ul style="list-style-type: none"> ✓ Degradation as well as encroachment on the “Puspabhadra river” and “Lachit Garh” due to growth of population 	<ul style="list-style-type: none"> ✓ Revival of Pushpabhadra River which can be developed as a major drainage system in the GP
<ul style="list-style-type: none"> ✓ Occurrence of flash flood due to lack of proper drainage system 	<ul style="list-style-type: none"> ✓ Potential for heritage cum park and open museum
<ul style="list-style-type: none"> ✓ Cases of skin problem recorded probably due to nearby industries 	<ul style="list-style-type: none"> ✓ Potentiality to develop the GP as a ideal handloom and textile hub
<ul style="list-style-type: none"> ✓ Handloom Industry is degrading due to low profit and better alternatives 	<ul style="list-style-type: none"> ✓ Better transportation facilities and good market linkage with Guwahati city
<ul style="list-style-type: none"> ✓ No Solid Waste Management System in the GP 	<ul style="list-style-type: none"> ✓ There is a scope in the field of sports as the GP is active in number of sports and has represented at national level particularly in Ball Badminton.




2.13 Skill Development & Livelihood




The skills of the villagers can be developed by using various available rural technologies, that would make them self-reliant and lead to **Atmarnirbhar Bharat**. Some of the available rural technologies are presented in Table 2.11. There is a strong need to bring simple rural technologies to the skill development agenda in the North Eastern region of India while creating a way forward plan. There are success stories of young entrepreneurs who have started on a small scale, overcome the difficulties and have grown to make a name for themselves in the region, providing the necessary fillip to the rural economy of the North Eastern region of India.

Table 2.11: Skill development using rural technology

Sl No	Skills	Usefulness
1	<p>HANDLOOM</p> 	Different products like Mekhela Chador, Dhoti, Jacket, Gamocha, Stoles, curtain, etc.
2	<p>MUD BLOCK MAKING</p> 	Compressed Earth Block (CEB), also known as a Pressed Earth Block or a Compressed Soil Block, is a building material made primarily from damp soil compressed at high pressure to form blocks. The blocks, stabilised with a chemical binder such as cement are called compressed stabilised earth block (CSEB) or stabilised earth block (SEB). The CSEB or Mud Block can be a sustainable housing option, reducing ecological foot print and degradation of environment while promoting employment and entrepreneurship locally.

<p>3</p>	<p>ELECTRO SPARK COATING</p> 	<p>A micro cold-welding process designed to improve the tool life by 300 per cent in a cost-effective manner, mainly to improve or to increase the wear resistance on agricultural, mining, automotive, plastic molding, steel dies, etc. The goal is to make this technology accessible to all entrepreneurs.</p>
<p>4</p>	<p>SOYA/ MILLET PROCESSED PRODUCTS</p> 	<p>Soya bean products are becoming increasingly popular throughout the world as a major food because of their nutritive value and health protective properties. Soya and soya products are rich in good quality protein. Training programmes offered by institutions on soya processing, papad and millet-based products should be encouraged.</p>
<p>5</p>	<p>Apiculture</p> 	<p>Beekeeping is an important activity among farmers and families residing in rural areas for income generation. Apart from honey, various valuable by-products of highly medicinal and commercial value can be obtained from various processes. The declining population of honeybees due to chemical farming practices can only be addressed by promoting beekeeping to ensure pollination of plants to sustain life on earth.</p>
<p>6</p>	<p>Mushroom Cultivation</p> 	<p>Mushroom cultivation helps in improving livelihood of people through economic, nutritional and medicinal contributions. The people can cultivate fresh mushrooms and prepare value added products.</p>

7	<p>SOLAR DEHYDRATION</p> 	<p>Fruits, Vegetables and other perishable items are processed through solar dehydration technology. Using this technology dehydration process had become very simple and fast. It is hygienic method thereby protecting from dust, insects and flies.</p>
8	<p>Handmade Paper Conversion & Value Addition</p> 	<p>Handmade paper making is one of the very valuable processes which can help in addressing the issue of waste disposal. Production of recycled handmade paper from waste of plant species like banana, jute, mulberry, manila & hemp and waste like paper, cardboards, cotton fabrics, etc.</p>
9	<p>HOME-BASED PRODUCTS</p> 	<p>Household cleaning products like detergent powder, dishwashing powder & liquid, bathing & washing soaps, phenyl, toilet & floor cleaner and many others are in good demand. Training programme on all these aspects should be conducted to assist women SHG members and entrepreneurs who want to start home based product units.</p>

10	<p style="text-align: center;">CANE & BAMBOO HANDICRAFTS</p> 	Skill development on making flower pots, bamboo baskets, dining table mats, fruit basket, sieves, dustbins lamp shade and more can be conducted
11	<p style="text-align: center;">BAKERY</p> 	Skill development on product composition, ingredients, baking, making chocolates, cakes, biscuits, pastries, Lamington, etc.
12	<p style="text-align: center;">FOOD PROCESSING</p> 	Skill development on kitchen cleanliness, vegetable cutting and preparation, juice extraction, jam preparation, cooking and serving meals

CHAPTER 3

20 YEARS VISION PLAN

In this chapter, 20 years vision plan is proposed for Saraighat GP. The vision is proposed for the next 5 years, 10 years and 20 years, respectively. Primary objective is to ensure sanctity of agricultural and green/vegetation/grazing lands, for a sustainable future. For holistic development and planning, keeping in mind the 3 pillars of Sustainability, the following elements of Spatial planning were iteratively developed:

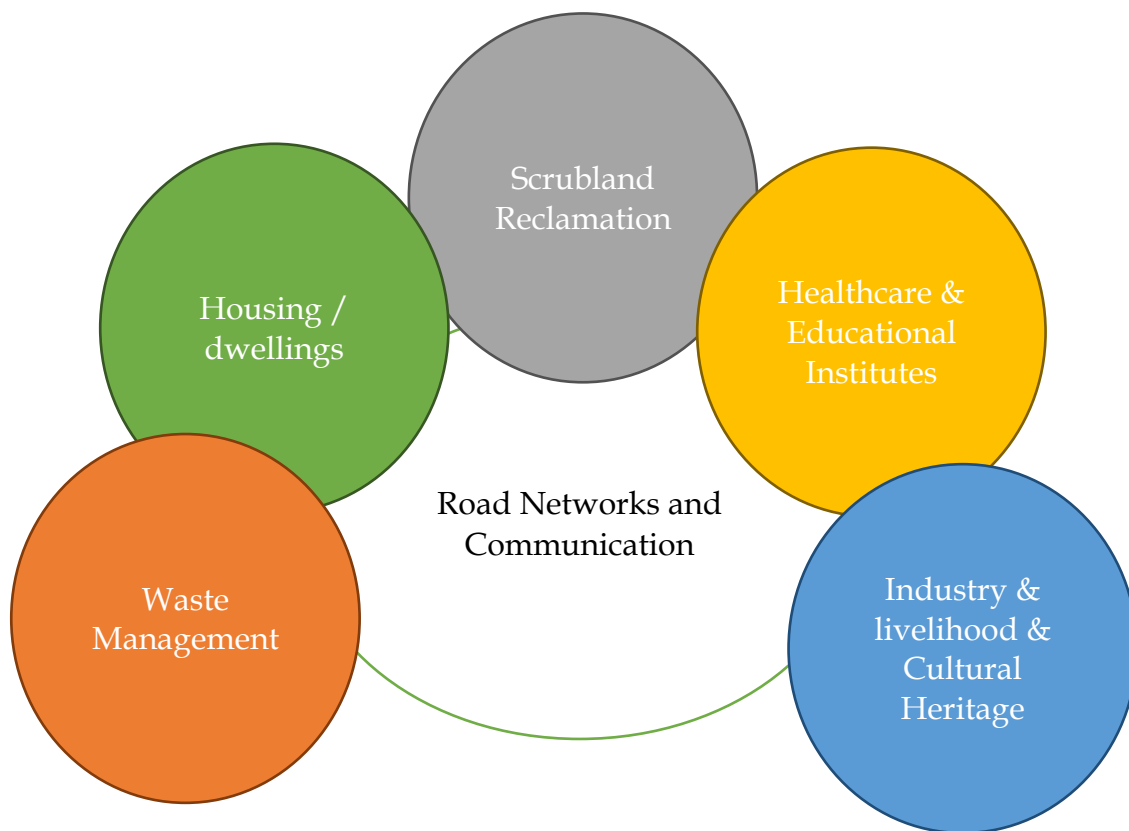


Fig 3.1 Elements of Spatial planning

Table: 3.1 Proposed 5 Years Vision for Saraighat GP

Proposed 5 Years Vision for Saraighat GP	
Road Networks & Communication	<p>Immediate action plan on:</p> <ul style="list-style-type: none"> • Making Kutcha Roads into Pucca, with necessary embankments • Adding Solar Streetlights, street signages and dustbins, • Completion of drains along roads • Improve internet and data penetration
Housing/Dwellings	<p>Immediate requirement of:</p> <ul style="list-style-type: none"> • Policies on land-use restricting encroachment of agricultural land and green/open spaces; • Implementation of roof top rain water harvesting and • Solar panel integrations for household subsidy schemes • Provision of drinking water line to all houses • Assistance in setting up of toilets
Scrubland Reclamation	<p>Immediate action on:</p> <ul style="list-style-type: none"> • Identification and demarcation of public scrubland • Public awareness regarding integrated farming • Assignment of caretaker-community of spaces - each space to be cared by its immediate locality/ neighbourhood members • Begin reclamation of scrubland
Waste Management	<p>Immediate action plan on:</p> <ul style="list-style-type: none"> • Establishing waste segregation and collection protocols • Training of waste handlers • Provision of protective gears for waste handlers • Educating populace on waste segregation and management protocols • Demarcation of site for waste management – composting/ segregating recyclable waste, appropriately discarding e-waste, setting up sump tanks.

<p>Healthcare & Educational Institutes</p>	<p>Immediate support to:</p> <ul style="list-style-type: none"> • Upgradation of existing veterinary hospital • Upgrade existing healthcare facilities in terms of infrastructure to extend facilities, such as, more space, more no. of clinics, operating theatres, immunization facility, labs, pharmacy, etc. • Upgrade existing schools/colleges in terms of space, infrastructure, and technology for incorporating NEP2020 best practices, such as, experiential learning and games-integrated learning, offer support with inter connectivity for online learning
<p>Industry & livelihood & Cultural Heritage</p>	<p>Immediate support to:</p> <ul style="list-style-type: none"> • Remove illegal encroachment near Lachit Garh and Pusphabhadra River • To build capacity of the weavers and artisans engaged in manufacture of hand-woven products through skill up-gradation design & product innovation and infrastructural support • Establishment of organized home-stay facilities

Table: 3.2 Proposed 10 Years Vision for Saraighat GP

<p>Proposed 10 Years Vision for Saraighat GP</p>	
<p>Road Networks & Communication</p>	<ul style="list-style-type: none"> • Development of Secondary and tertiary road networks • Use of sustainable materials, such as permeable concrete paving • Integration of clear footpaths • Demarcation of traffic flow and • Curtailment of vehicular access
<p>Housing/Dwellings</p>	<ul style="list-style-type: none"> • Increasing of FAR in consideration with increase in no. of floors per residential building • Standardised design implementation of Assam type roof for the upper floors, using local materials • Planned expansion of housing area as proposed, with clear plot sizes having adequate area around as per NBC • Regular assessment of building condition and health

<p>Scrubland Reclamation</p>	<ul style="list-style-type: none"> • Complete phase-wise reclamation of scrubland • Demarcation and allocation of the same for various purposes • Establish community based integrated farming
<p>Waste Management</p>	<ul style="list-style-type: none"> • Successful waste segregation and management protocol best practices • Establishment of complete waste handling plant (solid and liquid) with provision of generation of bio-fuel and bio-based electricity • Integration of state-of-the-art technologies to monitor and improve management
<p>Healthcare & Educational Institutes</p>	<ul style="list-style-type: none"> • Upgradation of full-fledged veterinary hospital • Establishment of a dedicated agriculture institute & college to support farmers in science, technology and competence • Expanding the classroom learning to vocational training and remote learning through ICT
<p>Industry & livelihood & Cultural Heritage</p>	<ul style="list-style-type: none"> • Organizational and entrepreneurial support to locals for establishing MSMEs • Establishment of warehouses and cold-storage, with e-commerce backed inventory and B2B/B2C linkages • Establishment of heritage cum park and open museum

Table: 3.3 Proposed 20 Years Vision for Saraighat GP

Proposed 20 Years Vision for Saraighat GP	
Road Networks & Communication	<ul style="list-style-type: none"> • ICT integrated, monitoring of vehicular traffic and emission to manage pollution • Conversion of all navigable spaces to permeable and sustainable material
Housing/Dwellings	<ul style="list-style-type: none"> • Further increasing of FAR in consideration with increase in no. of floors per residential building as proposed • Further planned expansion of housing area as proposed, with clear plot sizes having adequate area around as per NBC • ICT enabled progression monitoring of building condition and health
Scrubland Reclamation	<ul style="list-style-type: none"> • Maintenance of existing and expansion in response to LULC at the time
Waste Management	<ul style="list-style-type: none"> • Become fully competent and independent at waste handling plant (solid and liquid) • Become model GP with excess generation of bio-fuel and bio-based electricity
Healthcare & Educational Institutes	<ul style="list-style-type: none"> • Become a regional education hub and support for expertise and the local • Establishment of stadium with fully-fledged indoor and outdoor facilities
Industry & livelihood & Eco-tourism	<ul style="list-style-type: none"> • Become an entrepreneurship hub for indigenous o-based and skill-based agriproducts • Become a handloom & textile hub

CHAPTER 4

CONCLUSIONS

In this study emphasis on the various aspects for preparing a template for a spatially integrated version of the GPDP, namely the GPSDP (Gram Panchayat Spatial Development Plan) for a long-term perspective with respect to the spatial layers corresponding to attributes like physical Infrastructure, Social Infrastructure, land use in Abadi area, Agriculture, overall land and Water Management plan etc. are made.

Panchayat members through Panchayat meetings verified the spatial proposals made by the team and this proposed spatial plan is a participatory plan of the GP.

The Gram Panchayat chosen for this demonstration project is Saraighat GP situated in Bezera block, Kamrup District, Assam. It is located at a distance of 40 km from the Guwahati city. The geographical area is 20.19 sq. km. Total number of households is 3500 and the present total population of the GP is 16000. There are some specific findings inferred from the present analysis which are as follows:

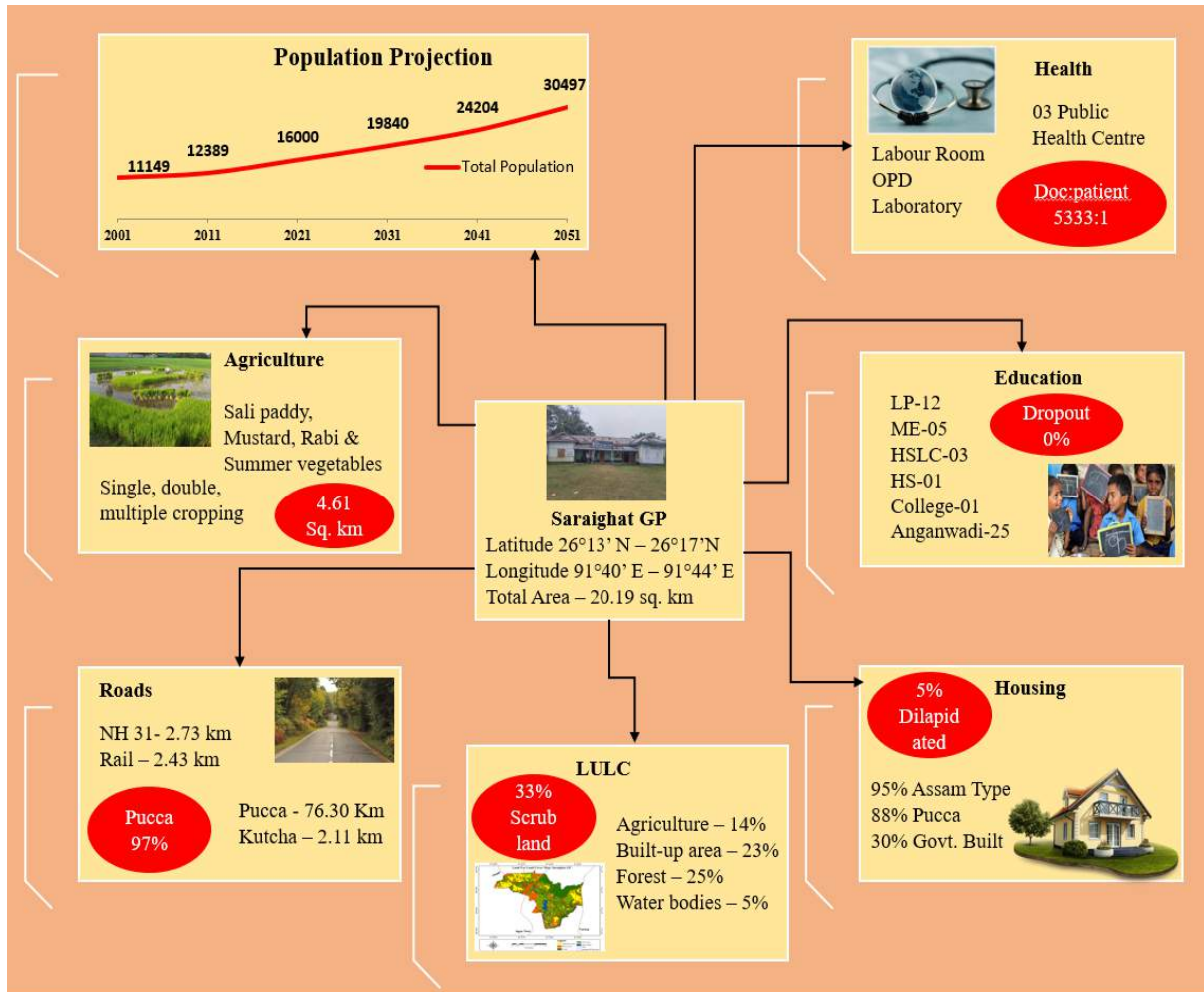
- i. It can be observed that around 33% of total area of GP is occupied by scrub land. These scrub land could be converted to agriculture land and other allied activities by adopting proper land and water management plan. These areas are not properly utilized for sustainable development.
- ii. These scrublands have potential to be used for integrated farming comprising of various components like pisciculture, duckery, apiculture, etc. that would create excellent livelihood opportunities for the people.
- iii. The soil types found in Saraighat GP are alluvial soil, Peaty and Marshy Soil, and Forest and Hill Soil, which are loamy in texture. The Alluvial, and Peaty and Marshy Soil, supports growth of wide variety of crops such as rice, sugarcane, jute, potato and other vegetables.
- iv. The Lachit Garh heritage site of the GP has potential to be developed as archaeological tourism spot with art gallery representing architectural or technological ensemble or landscape.
- v. The GP is rich in traditional indigenous handloom and textile activities and has the potential to become handloom and textile hub of India. Handloom Textiles sector would create sustainable source of employment and to patronize handloom products as great harbinger of cultural heritage of the state.

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APPENDIX

Saraighat GP at a Glance



APPENDIX

Spatial Data Provided by National Information Centre (NIC), Delhi and National Remote Sensing Centre (NRSC), Hyderabad

Thematic layers namely roads, rails, drainage, slope, contour, soil, Settlement and land use landcover have been provided in the format of vector files with further classification in the attribute table for each theme. The Information sources for development planning are presented in Table A.

Table A. Information sources for development planning

SL No	Data/Map	Source	Spatial/Non-spatial
1	Digital Elevation Model	NIC, NRSC	Spatial
2	Geomorphological Map	GSI	Spatial
3	Lithological Map	GSI	Spatial
4	LULC Map	High Resolution Satellite Imagery	Spatial
5	Soil Map	NRSC, NIC	Spatial
6	Groundwater Quality Map	NRSC, NIC	Spatial
7	Meteorological Data	IMD	Spatial
8	Road	NRSC, NIC	Spatial
9	GP Boundary	NIC	Spatial

GLIMPSE OF FIELD SURVEY



*Aao Gaon ko Sajaye
Bhabishayo ko Samridh
Banaye!!*

- Thank You !!